SD Department of Transportation
Office of Research

U.S. Department
of Transportation
Federal Highway
Administration

SD2006-00-G

Guidelines for Performing Research for the South Dakota Department of Transportation

Office of Research–Room 164
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September 2006

DISCLAIMER

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ACKNOWLEDGEMENTS

This document was produced in cooperation with the United States Department of Transportation Federal Highway Administration.

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
SD2006-00-G		

4. Title and Subtitle	5. Report Date
Guidelines for Performing Research for the South Dakota Department of Transportation	September 1, 2006
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
David L. Huft	

9. Performing Organization Name and Address	10. Work Unit No.
South Dakota Department of Transportation Office of Research 700 East Broadway Avenue Pierre, SD 57501-2586	11. Contract or Grant No.

12. Sponsoring Agency Name and Address	13. Type of Report and Period Covered
South Dakota Department of Transportation Office of Research 700 East Broadway Avenue Pierre, SD 57501-2586	Guide; September 2006
	14. Sponsoring Agency Code

15. Supplementary Notes

16. Abstract

The South Dakota Department of Transportation conducts research to discover knowledge needed to improve transportation technology. The Department's Office of Research performs and manages research under the direction of the Department's Research Review Board. Individual projects are performed under the guidance of project technical panels.

This publication explains the roles of the Office of Research, the Research Review Board, and technical panels in the research management process, and describes the procedures used to develop and administer the research program. Guidelines are presented for preparation of research proposals and reports.

Significant changes from prior editions of this document include:

- explicit advice to prospective contractors to review the *Sample Agreement for a Research Study...* in the Appendix to be aware of terms that will govern contractors and subcontractors (page 25);
- statement that SDDOT considers proposals to be privileged and confidential information (page 25);
- changes to reporting requirements (pages 28 and 42), requiring submission of electronic and camera-ready versions of final reports and executive summaries, in lieu of publication of large quantities of paper copies;
- instructions requiring a stronger treatment of benefits in research proposals (page 28);
- requiring separate budget tables for each subcontractor listed in a research proposal (page 31);
- specifying imperial (English) units, rather than the International System of Units, as the preferred system of measurement units (page 32);
- requirements for an analysis of research benefits in final reports (page 42);
- addition of a section on preparation of technical memoranda (page 45);
- addition of a chapter on invoices and allowable costs (pages 49-52);
- requirement for prompt payment of subcontractors and suppliers (page A-2);
- statement that subcontracted costs prior to an established subcontract are ineligible for payment (page A-2);
- requirements for insurance by research contractors (A-8).

17. Keywords	18. Distribution Statement
research; management; administration	No restrictions. This document is available to the public from the sponsoring agency.

19. Security Classification (of this report)	Security Classification (of this page)	21. No. of Pages	22. Price
Unclassified	Unclassified	73	

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INTRODUCTION

The Office of Research administers and performs research conducted by the South Dakota Department of Transportation (SDDOT), under the direction of the Department's Research Review Board. The research effort addresses topics considered most important to the Department's mission of providing effective transportation to the State of South Dakota.

When sufficient manpower and expertise is available within SDDOT, the Office of Research may elect to perform research in-house. Alternatively, the Office of Research may contract with other agencies to provide needed services. Contract research is most appropriate when outside expertise, perspective and manpower are needed.

Guidelines for Performing Research for the South Dakota Department of Transportation provides general information concerning the conduct of research for SDDOT. It also contains specific instructions for preparation and submission of research proposals and describes how proposals are evaluated. Instructions are likewise provided for report preparation. Finally, the document includes a sample agreement used for contract research.

Additional information may be requested by writing or calling

South Dakota Department of Transportation
Office of Research
700 East Broadway Avenue
Pierre, South Dakota 57501-2586
Phone: (605)773-3292 Fax: (605)773-4713

RESEARCH ADMINISTRATION

The South Dakota Department of Transportation conducts research to discover knowledge needed to improve transportation technology. Specific goals include evaluation of new materials and methods, development of design and analysis techniques, and study of underlying causes of transportation problems.

The Department's research effort is administered by its Office of Research, which has immediate responsibility for the management and conduct of research. To ensure that research is responsive to the Department's needs the Research Review Board, composed of managers from throughout the Department, oversees the total research effort. Employees of other offices within the Department assist as members of technical panels which manage individual research projects.

Research Review Board

The Research Review Board oversees the Department's total research effort. Its responsibilities include advising the Office of Research, setting research priorities, and approving funding for studies, and recommending how research results should be implemented.

The Board's membership is broad and includes SDDOT and local government representatives:

- Secretary of Transportation
- Deputy Secretary of Transportation
- Director, Division of Planning/Engineering
- Director, Division of Operations
- Director, Division Fiscal & Local Assistance
- Chief Highway Engineer
- Materials & Surfacing Engineer
- Research Engineer
- Research Staff Engineer
- Field Operations Representative
- City Government Representative
- County Government Representative
- Federal Highway Administration Research Coordinator
- SD Board of Regents System Vice President for Research

The Director of the Division of Planning/Engineering chairs the Board, and the Research Engineer is its secretary. The City, County, and Field Operations representatives serve two-year terms, beginning on January 1 of even numbered years. The other representatives serve as long as they hold their respective positions.

Office of Research

The Office of Research is responsible for performing the work directed by the Research Review Board. Its responsibilities include:

- Developing annual research programs
- Administration of contract research projects
- Conducting in-house research
- Advising other SDDOT offices

The Office of Research is staffed by the Research Engineer, a secretary, and other engineers from several disciplines, including chemistry, civil engineering, computer science, electrical engineering, and geotechnical engineering.

Technical Panels

Individual research projects are managed by small panels of experts in the research topic. Each panel's membership is drawn from SDDOT's central and field offices, and may include representatives from outside the Department. The panel's responsibilities include:

- Developing problem statements
- Recommending study funding and duration
- Recommending in-house or contract research
- Evaluating research proposals
- Selecting research contractors
- Monitoring research progress
- Recommending implementation of research

Every panel is chaired by an Office of Research staff person, whose responsibilities include:

- Scheduling panel meetings
- Maintaining contact with researchers
- Monitoring contract compliance
- Writing panel documents

Most panels include a second member of the Office of Research, who assists and serves as a backup to the panel chairman.

ANNUAL PROGRAM OVERVIEW[1]

In 1989, the South Dakota Department of Transportation adopted an annual research selection process. Except for emergency research needs, the Department intends to select all research topics and award all research contracts according to the process summarized by Table 1.

Research Suggestion Forms

Each year, the Office of Research solicits research problems from the Department's central and field offices. In meetings with individual offices or in Department-wide need assessment meetings, Department personnel are asked to suggest research pertinent to their needs. The Office of Research also invites suggestions from the academic and consultant communities. Suggestions should address actual concerns of the Department rather than topics which are of specific interest to individual researchers.

Suggestions for research are made on Research Suggestion Forms (Figure 1), which name the problem and describe it briefly. Research Suggestion Forms suggest research objectives, an approach for achieving those objectives, and how the research results might be implemented. The forms provide enough information to allow the Research Review Board to appreciate the significance of the problem, but do not elaborate on details.

The Office of Research compiles all of the Research Suggestion Forms and briefly comments on them. A complete package of forms, along with a simple ballot form, is provided to the Research Review Board prior to its August meeting. During the meeting, the Office of Research tallies the ballots and prepares an ordered list of project titles. The list does not represent a final selection of projects; instead, it is a starting point for the Board's discussion of project priorities. Based on its discussion, the Board may promote or demote topics on the list or combine related

[1]Although the annual research process still applies, it has given way in recent years to a more responsive approach in which projects can be suggested and initiated throughout the year. This chapter will be rewritten during calendar year 2006 to reflect these procedural changes. As written, the chapter still provides useful description of how research is initiated, performed, and completed .

Table 1 Annual Research Program

Task	By whom	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr
Solicit Problems	Office of Research												
Compile Problems	Office of Research												
Prioritize Problems	Research Review Board												
Assign Technical Panels	Office of Research												
Define Projects	Technical Panels												
Approve Program	Research Review Board												
Develop RFPs	Office of Research												
Distribute RFPs	Office of Research												
Develop Proposals	Researcher												
Evaluate Proposals	Technical Panels												
Authorize Contracts	Research Review Board												
Develop Agreement	Office of Research												
Conduct Research	Researcher	(duration as necessary)											
Monitor Research	Technical Panel	(duration as necessary)											
Report Findings	Researcher												
Recommend Action	Technical Panel												
Review & Comment	Divisions & Regions												
Recommend to Secretary	Research Review Board												
Authorize Action	Secretary of Transportation												

suggestions into a single topic. Through consensus, the Board prioritizes the list on the basis of benefit to the Department, likelihood of success, urgency and probable funding requirements.

Those studies deemed of highest priority are tentatively included in the following year's research program. The remainder are retained for possible reconsideration in a later year.

Research Project Statements

For each selected study, the Office of Research begins to assemble a technical panel of five to eight persons knowledgeable of the topic. First, the Research Engineer appoints a research staff member to chair the panel and another to act as an alternate. While the panel chairman and alternate initiate a preliminary literature search through the Transportation Research Information Service (TRIS), the Research Engineer invites Region Engineers, Division Directors, and the FHWA Division Administrator to nominate technical panel members. Depending on the nature of the study, the Research Engineer matches Regions, Divisions, and FHWA to specific projects, but does not suggest names of nominees. Naming the nominees is entirely up to the Region Engineers, Division Directors, and the FHWA Division Administrator.

In addition to Department and FHWA panel members, the Research Engineer invites members from other state agencies, trade associations, private industry, and universities. Invitations are extended on the basis of known interest and knowledge in the research topic. The goal of the appointment process is to assemble a panel with broad knowledge and diverse viewpoints.

After reviewing background information provided by the literature review, the technical panel meets to develop a Research Project Statement (Figure 2). The panel determines whether research is warranted and, if so, what the nature of the research should be. The panel begins with the Research Project Suggestion Form, but usually modifies the suggestion in consideration of the literature review and the knowledge, experience, and concerns of individual panel members.

The Research Project Statement produced from the meeting describes the problem that motivated the research suggestion and assesses the topic's importance and urgency. The most pertinent findings from the literature review are briefly summarized. Previous results that may obviate the need for research or provide a starting point for further work are cited. Then the panel states its opinion as to whether research is or is not needed.

If research is warranted, the panel defines the study's objectives (what is to be learned or produced from the study) and tasks (what is to be done to accomplish those objectives). Objectives must be attainable within the research effort. For example, improving safety is probably not an attainable objective because many factors affecting safety lie outside the control of the research investigation, but identifying methods to improve safety could well be attainable. Furthermore, the tasks must be defined so that performing them effectively will likely produce the results sought in the objectives. Crafting the study's objectives and tasks is one of the technical panel's most important duties.

After the objectives and tasks are defined, the panel describes how the results of the study might be used, and recommends the study's budget, duration, and funding source. It describes what involvement the Department must provide to support the research project. Finally, the panel recommends the type of research it feels most appropriate:

- *In-House Research* is appropriate if staff of the Office of Research have expertise in the topic and available time to perform the work.

- *Contract Research* is appropriate if expertise or available time do not exist within the Office of Research. Contract research projects are competitively awarded.

- *Collaborative Research* involves a team consisting of a principal investigator from the Office of Research and co-investigators from South Dakota universities. It is appropriate when the combined expertise of staff from the Office of Research and one or more universities can address the topic effectively.

- *National Research* is appropriate when the proposed research requires large amounts of funding and the topic is likely to interest other agencies. Potential research mechanisms include the National Cooperative Highway Research Program (NCHRP), the Transit Cooperative Research Program (TCRP), and national and regional pooled fund studies.

Each panel submits its Research Project Statement to the Research Review Board, who decides which studies should be retained in the annual research program. If insufficient resources are available to fund or perform all studies, the Board decides which to cancel or postpone.

Contract Research

The Office of Research develops a Request for Proposal (Figure 3) for each study for which contract research was recommended. The RFPs are based upon the Research Project Statements developed by the studies' technical panels.

RFPs are distributed to prospective researchers, including universities, consultants and government agencies, around December 1. Proposals are due on the date specified on the RFP, usually in February.

In March, each technical panel reviews all proposals submitted for its research project. The panel selects a research contractor to perform the work on the basis of:

- the proposer's demonstrated understanding of the problem
- the merit of the proposed research approach
- the probability of success in achieving the project's objectives
- the proposer's record of accomplishment in related problem areas
- the adequacy of research staff and facilities
- the proposer's record of past performance for SDDOT

Panels use a proposal evaluation form (Figure 4) to help identify proposals' strengths and weaknesses.

The importance of the written proposal cannot be overemphasized; it is usually the panel's only means of selecting the researcher to conduct the study. The proposal must be concise, clear and complete. Most importantly, it must convince the panel that a sound research project will follow.

If the panel identifies specific weaknesses in the selected proposal, it may ask the researcher to address them. This negotiation process must produce a modified proposal that is mutually acceptable to the panel and the researcher. Otherwise, another researcher must be selected or the study delayed or cancelled.

South Dakota Department of Transportation
Suggestion for Research
2001 Program

1. **Research Project Title—**

2. **Problem Statement—**What is the nature of the problem needing solution? What aspects of the problem are especially significant? How does the problem adversely affect transportation facilities or services?

3. **Research Proposed—**What research do you propose to solve the problem?

4. **Anticipated Benefits**—If this research is successfully completed, what benefits will the Department realize? What is their value?

5. **Urgency—**How urgent is this research? Is it important that it be done soon? Why?

6. **Submitted By**

Name_. . . . . .

Title . . . . . .

Organization . . . . . .

Address . . . . . .

City, State, ZIP . . . . . .

Phone/FAX . . . . . .

7. **Submit by June 30, 2000 To**

South Dakota Department of Transportation
Office of Research Room 164
700 East Broadway
Pierre, SD 57501-2586

Phone:(605)773-3292
FAX: (605)773-4713

Thanks!

Figure 1 Research Suggestion Form

South Dakota Department of Transportation
Research Project Statement
Project SD199D95-07

Title: Criteria and Guidelines for Innovative Contracting

Problem Description: Long duration of construction projects can cause unacceptably long lane closures in urban and rural areas and lead to late season and multi-season construction. Excessive duration can potentially affect safety and increase engineering costs. To address these problems, states have begun to use innovative contract mechanisms, such as "A+B", lane rental and incentives/disincentives, which consider time duration as well as cost. The South Dakota Department of Transportation has occasionally tried incentive/disincentive clauses, but the use of innovative contracting procedures has been limited because potential benefit has been difficult to determine. Furthermore, the Department has not yet defined criteria for using innovative contracting, developed methods for estimating road user costs, determined how to consider maintenance and safety impacts, or established contractual procedures. Finally, potential effects on the contracting industry and its labor needs are unknown. Research is needed to evaluate the potential of innovative contracting procedures in South Dakota and to define guidelines for its use.

Importance: Increased use of contract mechanisms which consider time duration could produce savings in cost and effort to the Department, industry, and the public, especially in urban areas. Safety could also increase. But increased use is unlikely without assurance of innovative contracting's potential benefit. Guidelines would provide a basis for consistent Department policy and would reduce the chance of using innovative contracting in inappropriate circumstances.

Urgency: The topic does not constitute an emergency, but completing a study in time to affect the 1996 or 1997 construction season would be useful.

Literature Summary: The use of alternative contracting procedures is rapidly increasing nationally. Many agencies have found that actual construction costs do not increase significantly. Of the various types of innovative contracting which have been tried, those which concentrate on time provisions seem most appropriate to South Dakota's organization and contracting environment. South Dakota's own experiences, such as the Elk Point I29 interchange, 10th/11th Street in Sioux Falls, Interstate 90 rehabilitation in Jones County, and US12 in Brown County, suggest that innovative contracting holds potential.

Are research results already available? Yes **If so, how can SDDOT implement these results?** The experience of other states and federal agencies will be useful as background for assessing the potential of innovative contracting and developing guidelines for SDDOT.

In summary, does research need exist? Yes **Explain:** Before the Department can increase its use of innovative contracting, it needs guidelines and criteria for use. Reliable methods of estimating road user costs are especially needed.

Research Objectives:

1) To assess the feasibility and potential for using innovative contracting procedures in South Dakota.
2) To develop methods for estimating road user costs in South Dakota.
3) To develop criteria and guidelines for the systematic, appropriate selection and use of innovative contracting procedures.
4) To estimate the impact of innovative contracting on road user costs, engineering costs, construction costs, and construction quality.

Figure 2 Sample Research Project Statement (sheet 1 of 2)

Research Tasks:

1) Meet with the project's technical panel to review project scope and work plan.
2) Review and summarize literature pertinent to innovative contracting procedures.
3) Survey or interview personnel from other states' transportation departments regarding their experience and opinions related to innovative contracting.
4) From review of construction records and interviews with personnel from the Department and construction contractors, characterize the Department's prior experience with innovative contracting.
5) Assess the potential for application of innovative contracting procedures in the Department's recent and current five-year construction programs. Identify the number and types of projects amenable to innovative contracting.
6) Evaluate methods, including that used in the Department's Division of Planning, for estimating road user costs associated with construction activity.
7) Define criteria—including traffic levels, construction type, economic disruption, utilities, safety, risk, potential impact on other projects, and other relevant factors—and develop procedural guidelines for selection and use of each innovative contracting procedure.
8) Assess the potential impact of innovative contracting on construction, engineering, maintenance and road user costs, on safety, and on the contracting industry in South Dakota.
9) Prepare sample contracts for those innovative contracting methods found to be justified and recommend changes in SDDOT policies and procedures needed to adopt innovative contracting methods.
10) Prepare a final report and executive summary of the literature review, research methodology, findings, conclusions, and recommendations.
11) Make an executive presentation to the SDDOT Research Review Board at conclusion of the project.

Potential Implementation: This study may demonstrate the value of increased use of innovative contracting, and may propose accompanying procedural changes. It is expected to provide a more detailed and sound basis for establishing incentive and disincentive levels.

Budget Estimate: $45,000; 6 **months** **Funding:** SPR

SDDOT Involvement: Department personnel will supply construction records and participate in interviews.

Recommendation: Contract Research **Explain:** Examination of this topic requires expertise and objectivity best supplied by an outside consultant.

Technical Panel:

Tim Foerster . . . . . Construction Support
John Forman . . . . . Project Development
Warren Foss . . . . . Financial Systems
David Huft . . . . . Research
Dan Johnston . . . . . Research
Jim Keyes . . Associated General Contractors
Ken Eschmeyer . . . . . FHWA
Leon Schochenmeier Local Gov't Assistance
Tom Week . . . . . Yankton Area

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Figure 2 Sample Research Project Statement (sheet 2 of 2)

South Dakota Department of Transportation
Request for Research Proposal
1995 Program

Project Number: SD1995-08

Title: Design and Performance of Created Wetlands

Problem Description: Wetlands that are unavoidably impacted because of construction by the Department are required to be replaced. There are different ways to mitigate wetlands impacted by construction projects. The Department has used three types of compensation: 1) excavation, 2) creation of small dams and 3) restoration of areas that are degraded wetlands. Different designs for compensation areas have been tried to improve the quality of the created wetlands. The differences in the environment from southeastern South Dakota to northwestern South Dakota could mean that different designs based upon the environment of the area might be needed. Analyses of the designs used by the Department in regard to quality of wetlands created has not been done.

Other states have developed criteria for wetlands design. Guidelines that could point out do's and don'ts of wetlands compensation and design methods by physiographic regions of the state could ease the problems associated with wetland mitigation.

Research Objectives:

1) To evaluate existing compensation areas to determine the quality of wetlands created.
2) To develop guidelines for design of excavation type (borrow pits) compensation areas.
3) To develop guidelines for design of small dam compensation areas. These areas could include borrow areas in their design.
4) To develop guidelines for restoration of degraded wetlands.
5) To construct a prototype wetland compensation area that uses the guidelines developed in the previous objectives.

Research Tasks:

1) Meet with the project's technical panel to review project scope and work plan.
2) Review pertinent literature that can be used to determine methods of judging the quality of created wetlands and in preparing the three guidelines.
3) With advice from the technical panel select a statistically valid sample of wetlands created by all three types of compensation methods used by the Department. The representative sample must be done throughout the state. The sample will be used to determine the effectiveness of created wetlands designs used by the Department.
4) Evaluate the biological diversity of selected compensation areas. Biological categories that should be studied include, but are not limited to, aquatic invertebrates, fish, hydrophytes, amphibians and reptiles, birds, mammals and threatened and endangered species.
5) Review and summarize the adjoining land use, ownership, proximity to closest wetland, buffer zones, details of construction, etc. of the selected areas.
6) Based upon Tasks 2 through 5, develop the guidelines for the three types of compensation.
7) Prepare an interim report with findings, conclusions, and recommendations and meet with the Technical Panel to discuss the guidelines and the selection of the prototype wetland demonstration. Ideally the prototype would include all three compensation methods if practical. At a minimum the prototype site will include excavation type compensation and will be located in eastern South Dakota. The technical panel will select the site with advice from the researcher. Tasks 1 through 7 must be completed by September 30, 1996, so the prototype site design can be completed for the 1997 construction season.

Figure 3 Sample Request for Proposal (sheet 1 of 2)

8) Evaluate the prototype wetlands area for quality of wetlands using the same procedures used in Task 4 for a period of three years.
9) Prepare a final report and executive summary of the literature review, research methodology, findings, conclusions, and recommendations.
10) Make an executive presentation to the SDDOT Research Review Board at conclusion of the project.

Funds Available: $110,000

Contract Period: 60 months

SDDOT Involvement: Construction funds would have to be used to develop the wetlands prototype area. The design of the prototype area would also have to be done by the Department. Information on existing created wetlands would have to be provided.

General Information: The Office of Research of the South Dakota Department of Transportation (SDDOT) solicits proposals from colleges, universities, research institutes, foundations, engineering or other consultants, federal/state/local agencies or others who possess extensive, demonstrated capability and experience in the subject area.

Proposal Deadline: Proposals are due at the following address by 5:00 pm on February 17, 1995:

South Dakota Department of Transportation
Office of Research Room 164
700 East Broadway Avenue
Pierre, South Dakota 57501-2586

This deadline is firm. Extensions will not be granted. Ten copies of the proposal must be submitted.

Proposal Guidelines: Requirements for proposal preparation are found in the SDDOT Office of Research brochure entitled "Guidelines for Performing Research for the South Dakota Department of Transportation" dated November 1994. Proposals must be prepared according to this document.

Proposal Evaluation: Proposals will be evaluated by SDDOT Research staff and a technical panel knowledgeable in the problem area. Selection is made by the panel in consideration of:

1. the proposer's demonstrated understanding of the problem;
2. the merit of the proposed research approach;
3. the probability of success in achieving the project's objectives;
4. the proposer's record of accomplishments in related problem areas;
5. the adequacy of research staff and facilities.
6. the proposer's past record of performance for SDDOT.

Proposers will be notified of the results of the selection in writing no later than March 31, 1995.

Project Management: Blair Lunde has responsibility for management of this project, and can be reached at (605) 773-5961 to answer inquiries.

Ownership of Proposals: All proposals become the property of the South Dakota Department of Transportation. SDDOT reserves the right to reject any and all proposals submitted. SDDOT is not responsible for any costs incurred by proposers, including proposal preparation, prior to execution of a contract.

Figure 3 Sample Request for Proposal (sheet 2 of 2)

Considerations for Evaluating Research Proposals
South Dakota Department of Transportation
Office of Research March 1, 2001
SD2002-00 (Project Title)

General	1	2	3	Notes
Proposal properly interprets the Request for Proposal				
Proposal contains no technical errors				
Proposal contains no discrepancies, omissions, ambiguous or misleading statements				
Total				
Rank				
Problem Statement and Background Summary	**1**	**2**	**3**	**Notes**
Proposal demonstrates good understanding of problem				
Proposal demonstrates objective look at problem, not just opinion				
Proposal specifies the problem limits and restricts scope appropriately				
Proposal cites relevant literature and appreciates its significance				
Total				
Rank				
Research Plan (Objectives and Tasks)	**1**	**2**	**3**	**Notes**
Proposal cites specific objectives clearly				
Deviations from RFP's objectives are explained and justified				
Technical approach responds to all written specifications and requirements				
Approach also responds to implied requirements essential to study success				
Deviations from RFP's tasks are explained and justified				
Difficult areas are identified, and details for overcoming them are given				
Proposal represents a novel idea or technical approach				
Research plan is feasible				
Proposed effort is consistent with scope of problem				
Total				
Rank				
Products and Implementation	**1**	**2**	**3**	**Notes**
Proposal clearly defines products to be delivered at project completion				
Proposed solutions are practical				
Proposal includes a practical, realistic implementation plan				
Implementation plan reflects knowledge of SDDOT procedures and policies				
Implementation plan will fit SDDOT procedures and policies				
Total				
Rank				

Figure 4 Considerations for Evaluating Research Proposals (sheet 1 of 2)

Staffing & Facilities	1	2	3	Notes
Availability of personnel is clearly defined				
Proposal shows a depth of qualified personnel				
Proposal shows ability to manage a project of this size				
Personal qualifications are directly related to the requirements of the project				
Proposal includes plans for specific key personnel assignment				
Key personnel have relevant experience, education, and accomplishments				
Project does not depend excessively on subcontractors or recruited personnel				
There is a reasonable balance between professional and support personnel				
Proposer's location will not hinder project completion				
Proposer has adequate access to equipment required in study				
Proposal applies sufficient resources to the study				
Total				
Rank				
SDDOT Involvement	**1**	**2**	**3**	**Notes**
SDDOT involvement is not excessive				
SDDOT involvement is clearly described and quantified				
Total				
Rank				
Budget	**1**	**2**	**3**	**Notes**
Proposal includes complete budget by fiscal year				
Budget is consistent with proposed effort and resources				
Total				
Rank				
Proposer's Record of Past Accomplishment for SDDOT	**1**	**2**	**3**	**Notes**
Proposer satisfactorily completed past projects				
Proposer met scheduled commitments				
Proposer was cooperative and flexible				
Total				
Rank				
SUMMARY	**1**	**2**	**3**	**Notes**
GRAND TOTAL				
RANK				

INSTRUCTIONS: On a scale of 0 to 3, rate each proposal for each item listed. Assign a rating of 3 if the proposal addresses the item completely, 2 if it addresses it well, 1 if it addresses it partially, and 0 if it does not address it at all. This rating should be used as a tool for evaluating each proposal, but should not necessarily be used as the sole criterion for awarding the research contract. Other important considerations may also influence your selection decision. After a proposal is selected, use this form to identify any specific weaknesses which should be strengthened prior to final approval of a research contract. Your diligence at this stage of the project will be rewarded as the study progresses.

sd200100.eva

Figure 4 Considerations for Evaluating Research Proposals (sheet 2 of 2)

The panels present their recommendations to the Research Review Board, which must approve each proposal and authorize funding for the project. Unsuccessful proposers are notified after the Board's approval of a contract.

After researchers are selected, the Office of Research develops a formal agreement for the work. A sample agreement, included as Appendix A, specifies the standard terms for research funded by federal State Planning and Research funds. (In certain cases, SDDOT may elect to fund research with state funds. The agreement for state-funded research is essentially identical, except that SDDOT retains the right to inventions and discoveries.) The agreement incorporates the researcher's proposal by attachment.

After the agreement is executed, the Office of Research notifies the researcher that work may proceed. Generally, a May 1 starting date is possible. The researcher then conducts the research in accordance with the agreement and his proposal.

In-House Research

Studies for which in-house research was recommended require no contractor selection. Instead, the Research Engineer appoints a principal investigator and co-investigators from the staff of the Office of Research. The appointed researchers prepare a work plan in the same format as a research proposal.

Collaborative Research

A collaborative study is handled as a hybrid between in-house and contract research. After the Research Engineer appoints a principal investigator, he sends the Research Project Statement to state universities and invites them to express interest in the study. Using the universities' responses concerning the interest, qualifications, and availability of faculty and students, the principal investigator assembles a research team.

The principal investigator must prepare a comprehensive work plan describing the total research effort. Each participating university must prepare a proposal describing its portion of the project. A research contract is established with each university, using the same contract form used for contract research. Contracts must be approved by the Research Review Board.

Conduct of Research

After the research contract or (in the case of in-house research) the work plan is approved, the researchers may begin the work in accordance with their proposed plan.

The project's technical panel monitors the research throughout its duration. It reviews quarterly progress reports submitted by the researcher, as well as any interim reports specifically required by the agreement. It is the panel's responsibility to ensure that the researcher fulfills the terms of

the agreement and that the research objectives are met. Prior to conclusion of the research, the panel reviews the draft final report, and advises the researcher of any changes that are required. The researcher responds the panel's comments and submits a revised final report for publication. Usually, the researcher also makes an executive presentation to the Research Review Board.

Implementation

Upon completion of the study, the project's technical panel advises the Department how to use the research findings. The panel evaluates the validity of the research, and recommends any changes in policy, procedures or practice that should be adopted. As specifically as possible, the panel defines what actions should be taken and identifies which offices in the Department should be responsible for their completion. The panel may recommend:

- specification changes
- policy changes
- design changes
- training
- construction
- additional research

A sample Technical Panel Evaluation and Recommendations document is shown in Figure 5.

The Office of Research distributes the panel's recommendations to the Secretary of Transportation and the Department's Region and Division offices for comment. Then the Research Review Board considers the recommendations of the researcher and the technical panel's review comments (Figure 6). The Board recommends to the Secretary of Transportation to what extent the panel's recommendations should be adopted. The Secretary of Transportation evaluates the Board's recommendation, and directs appropriate Division and Region offices to accomplish necessary actions. When the implementation plan is effected, the project's technical panel is dismissed, and the project is considered complete.

Finally, the Office of Research publishes twice yearly a Research Implementation Status Report. For every completed study, the report lists the approved implementation recommendations and the status of each recommendation. The date the recommendation was completed is also listed. A sample page is presented in Figure 7.

Technical Panel Evaluation and Recommendations
SD1992-08 Rapid Determination of Soil Consolidation Parameters
July 15, 1993

Researcher: W. Allen Marr
Organization: Geocomp Corporation
66 Commonwealth Avenue
Concord, Massachusetts

Study Duration: May, 1992 to July, 1993
Study Cost: $29,871

Study Evaluation:

The contractor for the project was Dr. W. Allen Marr of Geocomp Corp. from Concord, Massachusetts. Dr. Marr has extensive experience in Geotechnical Engineering and has been designing soils testing equipment for several years.

The contractor's report demonstrated a vast knowledge of soil consolidation testing methods as well as extensive research in testing methodology. An optimum accelerated testing method was recommended based on this research. Verification testing was outlined and results provided along with conclusions.

The contractor's recommendation was to scrap the plan to update existing SDDOT soil consolidation equipment in lieu of purchasing newer proven technology at the same or less cost. He provided a turn-key testing system with data processing software allowing an accelerated testing procedure acceptable to SDDOT's needs.

Research Objectives		**Panel Comments**
1.	*Develop and verify an accelerated consolidation test procedure (using modified SDDOT equipment) that correlates to AASHTO T-216 standard.*	The consultant demonstrated that a proven system, the Loadtrac System, is available to satisfy this objective. The consultant also indicated that it would be more cost effective to purchase the system than to attempt to modify existing SDDOT equipment. The consultant provided adequate information demonstrating that the "primary consolidation plus one hour (e_{100} + 1 hr.)" abbreviated incremental consolidation testing procedure closely follows AASHTO guidelines. With only software modifications the Loadtrac system satisfied the objective.
2.	*Develop a data analysis program to process test data into consolidation parameters.*	Data analysis software is included in the Loadtrac system. The software generates complete consolidation reports including related tables and graphs.
Research Tasks		**Panel Comments**
1.	*Conduct an up to date literature review concerning consolidation testing techniques including inquiries of other state DOT's procedures.*	The consultant conducted an extensive literature review concerning consolidation testing techniques and procedures citing a considerable number of references and summarizing their research results. An in depth explanation of soil consolidation mechanics was provided satisfying this task completely.
2.	*Develop an accelerated consolidation test procedure that:*	
A:	*will use existing SDDOT Geotechnical Lab Equipment without major modifications.*	The consultant showed that modification of existing SDDOT equipment to allow an accelerated test procedure would cost as much or more than the purchase of a complete updated system and would not have near the functionality.
B.	*will be compatible with the standard SDDOT 2 inch soil sample and the 2.5 inch thin wall sample.*	The consultant provided confinement rings and related hardware to satisfy this task.
C.	*will not exceed 8 hours total, including sample preparation, testing, data recording, and clean up.*	The actual consolidation test time is dependent on the soil under test and will usually exceed 8 hours. This is acceptable because the new Loadtrac consolidation testing system is computer automated and the man time involved per test is approximately 2 hours. This time is for sample preparation, test parameter setup and clean up after the test. Also, any testing methods yielding results in a shorter period of time do not provide the quality of data required by the Geotechnical Lab.
3.	*Modify existing consolidation testing machine to accommodate accelerated test procedure.*	The consultant illustrated the steps involved in updating our existing equipment to accommodate the needed computer control and showed that for the sake of reliability, simplicity, and cost, complete replacement would be a more desirable alternative. The consultant installed a complete Loadtrac consolidation testing system consisting of an automated load frame assembly and a computer to control the system and process test data into reports.

Figure 5 Sample Technical Panel Evaluation & Recommendations (sheet 1 of 2)

4.	*Verify accelerated testing results by direct comparison with AASHTO T-216 standard test.*	The consultant ran a total of 23 tests using 7 different soil types. Some tests were run using existing SDDOT equipment and the standard AASHTO T-216 procedure (24 hour per load increment) and others using the automated Loadtrac system with the accelerated test procedure (primary consolidation plus one hour). The consultant's conclusion based on the test results is that effect of the load increment duration on time for primary consolidation is insignificant therefore, this method follows the T-216 guidelines.
5.	*Write a users manual to support testing procedure and equipment set-up.*	The consultant provided a complete users manual covering equipment set-up, maintenance, and data reduction software.
6.	*Develop user friendly, menu-driven data processing software for the IBM PC, compatible with HGA and VGA video adapters. Document with source code and users manual.*	The processing software was included with the Loadtrac system provided by the consultant. It is IBM compatible and can be used with standard SDDOT PCs. Since the software is commercial and was not developed with SDDOT funding, source code is proprietary and cannot be provided. A users manual was provided.
7.	*Submit a final report summarizing relevant literature, research methodology, findings and conclusions.*	The consultant provided a well written detailed report fulfilling the requirements of the project.
8.	*Provide training session at SDDOT Geotechnical Lab to familiarize personnel with test procedure and data processing program.*	The consultant installed and tested new Loadtrac equipment and provided a hands on training session at the Geotechnical Lab.

Research Recommendations:

The abbreviated consolidation test procedure used with the new equipment should not materially affect the compression parameters computed from the test data, therefore, the procedure may be used by the SDDOT without deviation from the AASHTO T-216 standard.

Panel Recommendations

The Office of Materials and Surfacing's Geotechnical Engineering Activity should adopt the automated consolidation test equipment and test procedure supplied by Geocomp Corporation.

Technical Panel:

Ron Dahme . . . . . Mitchell Region
Paul Orth . . . . . Office of Research
Kevin Griese . . . . . Office of Materials & Surfacing
Larry Weiss . . . . . Division of Engineering
Paul Nelson . . . . . Office of Bridge Design
Ginger Massie . . . . . Federal Highway Administration

sd199208.tpr

Figure 5 Sample Technical Panel Evaluation & Recommendations (sheet 2 of 2)

South Dakota Department of Transportation
Region & Division Review Comments
SD1991-02 Maintenance Painting of Older Structures
November 5, 1992

Region/Division	Comment
Aberdeen	None. *Larry Afdahl & Scott Schneider*
Mitchell	We agree with the Technical Panel findings. We prefer the option of epoxy/polyurethane in areas exposed to salts. We believe we will have many environments that are "aggressively corrosive". We believe our maintenance personnel can be trained to apply and do touch-ups with epoxy. We understand that the Central Office plans to purchase an Elcometer Adhesion Tester. We will use this instrument in the Mitchell Region. *Pat Kappenman*
Pierre	We agree with S.G. Pinney & Associates Study and the Technical Panel`s consensus that the use of epoxy mastics for bridge maintenance painting should be discontinued. The use of alkyd paints in the past has provided a satisfactory, long lasting protective coating on many of our structures and the adoption of the new alkyd system should provide even better results. One suggested change would be the use of the alkyd system for bridge guard rails as they are scraped nearly every winter and require frequent painting. The present x-cut method of testing for paint adhesion has not always given us a reliable indication of the paint condition. If the Elcometer 106 adhesion tests will eliminate this problem, purchase of the testers would be a good investment. Discussion with paint company personnel indicates that zero v.o.c. paints will be required in the near future. Should consideration be given to use of these paints at this time? *Lloyd Potter*
Rapid City	We agree with the Technical Panel Evaluation and Recommendations regarding Painting of Older Structures with one exception. We feel the alkyd system recommended to be used on less aggressive corrosion areas also be the recommended system on all components including guardrails, piers, etc. The Rapid City Region has recently tried the recommended alkyd system and found it easy to apply while providing good coverage and appearance. We have been using the water-based biodegradable cleaners with high pressure wash for several years and have found that this does an excellent job of surface preparation. This preparation, along with the alkyd system, should provide adequate protection for many years, especially in light of the fact that the guardrail's surface is scraped by the plows every year and must be touched up anyway. Also, the more forgiving alkyd system is more conducive to a good finished product when the outlying maintenance units are doing their own painting of guardrails. They are less likely to get an acceptable job with the short pot life, high tech epoxies. We also recommend the purchase of the Elcometer 106 adhesion testers to help eliminate future paint failures. *Jim Hennen*
Engineering	I agree with the panel. *Wally Larsen*
Finance	None. *Gay Rhoades*
Operations	I first want to say I think this was a very well done research project. I think the technical panel did a tremendous job and the contractor fit the bill. I only wish the study would have been done several years ago when this issue of lead first reared its ugly head. Overall, I support the recommendations of the report. I especially like the selection criteria developed for selecting painting candidates. I would like to suggest to the Board that they not implement recommendations which specially state for example, System "A" shall be used only here and in this way and System "B" shall only be used there in that way. Please leave that portion of the implementation up to the designer. *Mike Young*
Planning	None. *Jim Jenssen*
Railroads	None. *John Thune*

sd199102.rev

Figure 6 Sample Region and Division Review Comments

South Dakota Department of Transportation
Research Implementation Report

Study Number: SD1991-02 **Research Review Board Action:** 11/05/92
Title: Maintenance Painting of Older Structures **Secretary of Transportation Directive:** 12/24/92

#	Research Review Board Recommendation	Secretary's Directive	Responsible Division	Responsible Office	Action To Date	Date Completed
1	The Division of Operations, with concurrence of the Division of Engineering's Office of Bridge Design, should eliminate the use of epoxy mastic/polyurethane maintenance painting systems.	Approved	Operations Engineering	Maintenance Support Bridge Design	Done - Maintenance Standard changed and issued. We have not used epoxy mastic primers since 1991. Switched to alkyd paint system in 1993. This activity is complete	7/25/94 12/93
2	The Division of Operations, with assistance from the Division of Engineering's Office of Bridge Design and the Division of Planning's Office of Research, should develop new specifications for surface preparation and maintenance painting of older structures. In noncorrosive environments, VOC- compliant alkyds should be used. In corrosive environments, a surface tolerant inhibitive epoxy and polyurethane system should be used. Surface preparation should employ biodegradable water-based cleaners, 4000 psi power wash, abrasive sandblasting and power tool cleaning.	Approved	Operations Engineering Planning	Maintenance Support Bridge Design Research	Done - Maintenance Standard changed and issued. We have let several projects which used non-lead based alkyd systems, as per the consultant's report. Our paint construction specifications are to be revised in Spring 1995. Project inspectors need a paint inspection manual which tells them how to use equipment, what to inspect, and how to document the inspection. Some inspection equipment is on hand and some is on order.	7/25/94
3	The Division of Planning's Office of Research should purchase, at a total cost of approximately $4200, one paint adhesion tester for each Region's use in evaluating the condition of existing paint.	Approved	Planning	Research	Adhesion testers were purchased and delivered to each region and to the Office of Materials & Surfacing.	04/15/93

Figure 7 Sample Implementation Status Report Page

Roles and Responsibilities

The complete research process involves a large number of Department employees. Some roles—project definition, monitoring, and evaluation—fall within the scope of individual projects and are primarily the responsibility of the Office of Research and the technical panel assigned to the project. Other duties—project prioritization, funding approval, and direction of implementation—have Department-wide impact and require the involvement of the Research Review Board and other Department managers.

The phases of a research project are shown in Table 2, along with a breakdown of major tasks within each phase. The table generically identifies individuals and offices who are principally (P) responsible or secondarily (S) responsible for accomplishing the task, as well as those who review (R) or approve (A) the task product.

The following operational units are listed:

- Secretary of Transportation (Secy)
- Region Engineers and Division Directors and staff (R/Ds)
- Research Review Board (RRB)
- Division of Planning/Engineering (DPE)

Within the Office of Research (OOR) and Technical Panel, the table lists:

- Research Engineer (RE)
- Staff (technical & support) (RS)
- Panel monitor or chairman (PM)
- Technical panel members (TP)

Finally, the researcher or principal investigator (PI) is listed.

Table 2 Responsibility Matrix for Research Phases and Products

Phase	Product	SDDOT Operational Units				OOR		Technical Panel		PI
		Sec'y	RRB	R/D's	DPE	RE	Staff	PM	TP	
Project Selection	Annual Solicitation					P	P			
	Suggestion for Research		P	P			P			
	Research Problem Statement		R			A	P			
	Prioritized Annual Program	P								
Definition	Manager/Alternate Assignment					P				
	Technical Panel Appointments			P		S	S			
	TRIS Literature Review							P		
	Research Project Statement		A			R	R	P	P	
Contract Development	Request for Proposal					A	S	P		
	Research Proposal					R		P	P	P
	Proposal Negotiations					R		P	S	P
	Contractor Selection		A			R		P	P	
	Research Contract	A			R	R	S	P		A
	SPR Work Plan/Funding Request				A	P		S		
In-House	Assignment of Researcher					P				
	Research Work Plan					R		A	R	P
Investigation	Research Activity							R	R	P
	Progress Reports					R		A	R	P
	Interim Reports					R		A	R	P
	Final Report					R		A	R	P
	TP Evaluation/ Recommendations	R	R	R		R		P	P	
	Region Review Comments	R	R	P		S				
	RRB Recommendations	A	P			S				
Implementation	Implementation Recommendations	P				S				
	Implementation Actions	R		P						
	Implementation Report	R		P						

Legend: P—principal responsibility S—secondary responsibility R—review A—approval

PROPOSAL PREPARATION AND SUBMISSION

The Office of Research solicits research proposals from colleges, universities, research institutes, consultants, government agencies and others who possess extensive, demonstrated capability and experience in the subject areas.

Proposal Submission

Proposers must submit ten (10) copies of their proposals to the Office of Research. Proposals must arrive at the Office of Research on or before the time and date specified in the Request for Proposal. Proposals arriving after the deadline will not be accepted. Researchers' proposals must remain valid for at least 120 days after the deadline. The Office of Research will not acknowledge receipt of proposals unless a stamped, self-addressed post card is included in the proposal package.

All proposals submitted become the property of the South Dakota Department of Transportation. SDDOT has the right to use all information presented in any proposal, unless it is annotated as being proprietary. SDDOT considers all information contained in proposals as privileged and reserves the right to maintain its confidentiality. Selection or rejection of a proposal does not affect these rights.

SDDOT reserves the right to reject any and all proposals submitted. It may, under certain conditions, negotiate with the proposer to address specific weaknesses in a submitted proposal.

SDDOT is not responsible for any costs incurred by researchers, including proposal preparation, prior to execution of a contract.

Prior to submitting a proposal, proposers should review the *Sample Agreement for a Research Study Financed with State Planning and Research Funds Cost Reimbursement Contract*, which

is included as an appendix to this document. It specifices the terms that will govern the relationship between SDDOT, the project contractor, and all subcontractors involved.

Proposal Organization

The research proposal should be a well prepared document that defines the research problem and objectives, provides a detailed work plan for achieving the objectives, and indicates how the research findings are expected to be used. Proposals should simply and economically provide a straightforward description of the researcher's ability to meet the requirements of the RFP.

The following instructions are intended to help researchers prepare a proposal that will be accepted with a minimum of changes. Proposals **must** comply with these instructions to be considered. Failure to comply will seriously jeopardize the proposal's chances of selection.

Title Page

The proposal cover should include the following information, as illustrated by Figure 8:

- Proposal title (from RFP)
- Research project number (from RFP);
- "Submitted by" name, institution, address, and phone and facsimile numbers of proposer
- "Submitted to South Dakota Department of Transportation, Office of Research Room 164, 700 East Broadway Avenue, Pierre, SD 57501-2586"
- Proposal date

Table of Contents

On a separate page, list the proposal's sections and page numbers.

Problem Statement

Concisely express your understanding of the problem presented in the RFP. Do not simply repeat the wording of the RFP, but rather demonstrate your own insight into the problem.

Project Title
SD2003-xx

Submitted by
(your name)
(your affiliation)
(your address)
(city, state, zip code)
(phone number)
(fax Number)

Submitted to
South Dakota Department of Transportation
Office of Research Room 164
700 E Broadway Ave
Pierre, SD 57501-2586

(date)

Figure 8 Sample Proposal Title Page

Background Summary

Include background information on the research topic. Summarize the findings of a preliminary literature search and state the relationship of the proposed study to prior research. The summary should reveal your understanding of underlying principles and should clearly express your appreciation of the problem.

The importance of the background summary should not be underestimated. A comprehensive summary ensures that all aspects of the research topic have been adequately considered so new research can build upon prior work rather than duplicate it.

Objectives

State, in order, each of the study's technical objectives as it is cited in the Request for Proposal. Describe how each objective will be accomplished in the course of the research. Any deviations from the objectives listed in the RFP must be explained and justified.

Research Plan

Describe how the objectives will be achieved through a logical and innovative plan. State, in order, each task as it is cited in the Request for Proposal. Describe in appropriate detail how each task will be performed, and how each task contributes to accomplishing the study's stated objectives. Any deviations from the tasks listed in the RFP must be explained and justified.

The plan should also describe the technical basis of the research. Describe the following, as appropriate:

- Principles or theories to be used
- Significant variables to be tested
- Analytical and statistical procedures
- Experimental and testing procedures
- Evaluation criteria
- Inspection and survey methods
- Controls to be used
- Material or procedure development

The plan should be complete, providing the greatest level of detail that the researcher's understanding of the problem permits.

Products

List the products that will be delivered during the research project. Deliverables might include:

- Reports
- Computer programs
- Manuals
- Physical models
- Photographs
- Data bases
- Video or other audio/visual materials

Unless directed otherwise in the RFP, always include the following items as products:

- Quarterly progress reports (1 copy)
- Draft final report (10 copies);
- Final report
- Executive summary

Camera-ready copies of the final report and executive summary are required, as are electronic copies (in WordPerfect® or Microsoft® Word format) of each document, unless permission is specifically granted otherwise.

Implementation

Describe how SDDOT can apply the research results to improve its practice.

- Describe the form in which the research findings may be reported, such as a mathematical model, a laboratory test procedure, or a design technique. Describe these results in terms of the practicing engineer or administrator.

- State who would logically be responsible for applying the research results, such as the American Association of State Highway and Transportation Officials (AASHTO), the Federal Highway Administration (FHWA), the South Dakota Department of Transportation, and particular offices within SDDOT.

- Identify specific standards or practices that might be affected by the research findings, such as AASHTO or SDDOT specifications, policies and procedures, legislation, and funding or staffing requirements.

- Identify institutional issues, including resource requirements, that might need to be addressed for successful implementation.

If findings will not be suitable for immediate application at the conclusion of the research project, indicate what further work might be necessary.

It is understood that the actual research may produce unanticipated findings, making changes in the implementation plan necessary. This is acceptable. The proposal selection will be strongly influenced by the practicality and direction of the implementation plan presented in the proposal, however.

Benefits

Identify potential benefits expected from the research. Describe how the research results can be used, and by whom, to improve transportation practice. Possible benefits include:

- Direct cost savings
- Increased safety
- Increased facility life
- Improved service
- Improved work efficiency

To the extent possible, describe how these benefits can be measured and their how their financial value can be credibly determined when study results are put into practice.

Time Schedule

Provide a bar chart or other graphical presentation illustrating the scheduling of the major research tasks (Table 3). Indicate the number of months allocated to each task. Always allow twenty (20) days for SDDOT review of draft reports.

Table 3 Sample Task Time Schedule

Task / Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 Field Surveys																
2 Literature Review																
3 DOT Interviews																
4 Field Tests																
5 Observe Construction																
6 Analyze Cost Effectiveness																
7 Develop Recommendations																
8 Prepare Final Report																

Staffing

Include pertinent background information for principal investigators and other team members significantly participating in the project. Describe how academic, professional and research experiences relate to the project. Include a summary of past accomplishments in the same or closely related problem areas.

Provide a table showing the number of person-hours (not percentages of time) that will be devoted to each task by research team members, as illustrated in Table 4. List the names of principal investigators and other key professionals who will be involved. Support personnel may be identified by classification. If subcontracting is necessary, include subcontractors' key personnel and support staff in the table. Clearly identify subcontractors' involvement.

Describe current commitments to other work in sufficient detail to permit assessment of the researchers' ability to meet the proposal's commitments. Include a statement that the level of effort proposed for principal and professional members of the research team will not be changed without written consent of SDDOT.

Table 4 Sample Breakdown of Person-Hours

Name of Principal Professional or Support Classification	Role in Study	Task					Total
		1	2	3	4	5	
Professor A	Principal Investigator	20	30	10	0	10	70
Professor B	Co-principal investigator	15	25	20	20	0	80
Graduate Student 1	Field Testing	10	15	5	10	10	50
Graduate Student 2	Analysis	10	15	5	15	5	50
Administrative Staff	Administrative Support	5	5	5	10	5	30
Clerical Staff	Report Preparation	5	10	5	10	20	50
TOTAL		65	100	50	65	50	330

Facilities

Describe the facilities available to accomplish the research. Indicate equipment necessary to completion of the research and specify any restrictions on its use. Specify any equipment that is necessary but not currently on hand. If additional equipment is to be purchased with project funds, identify it in the budget estimate. Equipment purchased with project funds normally becomes the property of SDDOT at the conclusion of the project.

SDDOT Involvement

Describe any assistance required from the South Dakota Department of Transportation. Include such items as:

- Traffic control
- Construction
- Highway maintenance
- Drilling and sampling
- Access to transportation facilities
- Access to records or databases
- Interviews
- Material tests

Quantify the required level of effort as fully as possible.

Budget

Show the estimated cost for the entire research project by fiscal year, as illustrated by Table 5. SDDOT's fiscal years run from July 1 through June 30; for example, FY99 runs from July 1, 1998 through June 30, 1999.

Table 5 Sample Budget by Fiscal Year

Item	FY2001	FY2002	FY2003	Total
Salaries	12,000	14,000	7,000	33,000
Fringe Benefits[1]	2,400	2,800	1,400	6,600
Overhead/Indirect Costs[1]	4,400	5,600	4,600	14,600
Fixed Fee	2,250	3,840	3,400	9,490
In-State Travel	750	1,500	800	3,050
Out-of-State Travel	0	1,400	800	2,200
Equipment Purchase[2]	6,000	2,000	0	8,000
Expendable Supplies[3]	940	800	560	2,300
Subcontracts	0	12,000	4,000	16,000
Computer Time[3]	0	0	0	0
Report Publication[3]	0	0	580	580
TOTAL	$28,740	$43,940	$23,140	$95,820

Notes: 1. May be included with Overhead/Indirect Costs
2. Must be in accordance with 49CFR Part 1B
3. Only if normally treated as a direct cost

If the proposal includes effort by subcontractors, a similar budget table should be included for each.

Out-of-state travel, which is defined as travel between the researcher's base and destinations other than South Dakota, must be identified separately.

Indirect costs listed in the budget must be substantiated if and when the proposal is selected. Prior to the first contract payment, the successful proposer must submit documentation supporting the bases and rates used to calculate indirect costs by the prime contractor and each of the

subcontractors. Examples of indirect cost schedule formats can be found in Chapter 9 of the *AASHTO Uniform Audit & Accounting Guide*.[2]

Total funding should not exceed the amount indicated as "Funds Available" on the Request for Proposal. This amount represents what SDDOT feels the research topic merits and what level of funding should be necessary to complete the work. Proposers should set the scope and depth of study accordingly. Because of budget constraints, additional funding is highly unlikely. No budget extensions should be anticipated.

System of Units

All studies must be conducted and reported using imperial (English) units as the primary system of units. Values in the International System of Units (SI), commonly referred to as "metric" units, may be included in parentheses following the imperial values. This requirement is consistent with the South Dakota Department of Transportation's decision to return to imperial units as its preferred system of units.

Guidance on use of the metric system is given in ASTM Standard E380 for Metric Practice, available from the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103.

[2]American Association of State Highway and Transportation Officials (AASHTO) (2001). *AASHTO Uniform Audit & Accounting Guide for Audits of Transportation Consultants' Indirect Cost Rates* [WWW document]. URL http://audit.transportation.org

REPORTS

Reports are an integral part of the research process. Without reports, it is difficult or impossible to monitor the progress of research or communicate findings and recommendations. This chapter is intended to provide guidance on the preparation and review of several common report formats:

- *Final Report*—A summary of research, findings, and recommendations published at the conclusion of study.
- *Executive Summary*—A condensation, usually of a final report, intended for management review.
- *Interim Report*—Written at a significant milestone prior to completion of a study; may be published or used only for technical review.
- *Progress Report*—Written at regular intervals to permit review of progress during a study.
- *Presentation*—An oral presentation, often with visual aids, usually to technical reviewers or managers.

For each report type, this chapter describes standard formats to encourage:

- consistent appearance
- easier evaluation
- minimal rework
- clarity
- completeness
- adoption of research results

These formats are not intended to limit creativity.

General Formatting Guidance

Beginning with the year 2000, the Office of Research intends to publish its research reports primarily by electronic posting on the Internet. All reports should be formatted in a manner that is internally consistent and conducive to convenient desktop publication. Specific suggestions include:

- Use of standard, readily available fonts is encouraged. For text, a serif font such as Times or New Times Roman, at least eleven points high, is preferred. In tables, a non-serif font such as Arial or Helvitica, at least nine points high, may be used. Fonts should be employed consistently throughout the document.
- To the extent possible, tables should be formatted uniformly throughout the document.
- Formats of chapter and section headings should be used consistently.
- Captions of figures and tables should be formatted consistently throughout the document.
- Figures should be sized appropriately to enable easy interpretation.
- Figures that are scanned photographs should be scanned at a resolution sufficient to ensure clarity, but not at an excessively high resolution that will unnecessarily inflate the document file size.
- Documents should be set up for two-sided printing. Chapters should begin on odd-numbered (right-facing) pages.
- Overcrowding of information should be avoided.

Final Reports

Purpose and Length

At the conclusion of a study, researchers submit a final report to completely describe the research purpose, activity, findings, and recommendations. The report should contain complete details unless length prohibits. Report length depends on the topic's complexity and breadth, but usually a length of 20 to 100 pages is appropriate. In general, the organization of a final report should reflect the organization of the study's project statement and request for proposal.

Front Matter

The front matter identifies the report and describes its content and format. (To encourage a standard format, WordPerfect® and Microsoft® Word versions of generic front matter are available from the Office of Research.)

> *Front Cover*—The front cover (Figure 9) should be of light colored, heavy paper. It should identify who sponsored and performed the study and indicate the study’s title, number, and publication date:

- *Sponsoring Agencies*—The names and logos of sponsoring agencies are shown in the upper left corner of the front cover. For research sponsored entirely by state funds, only the name and logo of the South Dakota Department of Transportation Office of Research is shown. For research sponsored by federal funds, the name and logo of the Federal Highway Administration is also shown.

- *Report Number*—The report number is the study number followed by the letter designation "F", for example SD1995-02-F. If the report consists of more than one volume, the volumes are designated by a final number, for example SD1995-02-F1, SD1995-02-F2, etc.

- *Illustration or Photograph*—Optionally, a relevant photograph or illustration may be used to communicate the subject of the study.

- *Study Title*—The report title is usually the study name used throughout the duration of the study, unless the program manager agrees to another title.

- *Report Type*—The phrase "Final Report" identifies the report as a final report. If the report is a draft, the phrase "DRAFT Final Report" must be used.

- *Submitter*—The lower left corner contains the name and address of the organization reporting the research. Names of individual investigators are not listed.

- *Report Date*—The publication month and year are listed in the lower right corner.

SD1993-14-F

U.S. Department of Transportation
Federal Highway Administration

SD Department of Transportation
Office of Research

Enhancement of SDDOT's Pavement Management System

Study SD1993-14
Final Report

Prepared by
Deighton Associates Limited
112 King Street East
Bowmanville, Ontario, Canada

December 1994

Figure 9 Sample Final Report Title Page

DISCLAIMER

The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the South Dakota Department of Transportation, the State Transportation Commission, or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation.

ACKNOWLEDGEMENTS

This work was performed under the supervision of the SD1993-14 Technical Panel:

Toby Crow . . Planning and Programming
Mike Durick . . . . . Construction Support
Larry Engbrecht . . Materials & Surfacing
Brett Hestdalen . . . . . FHWA
David Huft . . . . . Research
Tom Johnson . . . . . Aberdeen Area
Norm Konechne . . . . . Pierre Area
Roger Lehmkuhl . . . . . Data Services
Blair Lunde . . . . . Office of Research
Ben Orsbon . . Planning & Programming
Johnny Reiff . . . . . Sioux Falls Area
Larry Schoenhard . . . . . Data Inventory

The contribution of the expert group on pavements is gratefully acknowledged:

Don Anderson . . . Materials & Surfacing
Toby Crow . . . Planning & Programming
Larry Engbrecht . . Materials & Surfacing
Gil Hedman . . . . . Materials & Surfacing
Jim Hoar . . . . . Winner Area
Norm Humphrey . . Maintenance Support
Tom Johnson . . . . . Aberdeen Area
Norm Konechne . . . . . Pierre Area
Dennis Landguth . . . Rapid City Region
Bob Orcutt . . . . . Brookings Area
Ben Orsbon . . Planning & Programming
Tom Week . . . . . Yankton Area

This work was performed in cooperation with the United States Department of Transportation Federal Highway Administration.

Figure 10 Sample Final Report Inside Cover

Inside Cover—The inside cover (Figure 10) lists SDDOT's standard disclaimer and acknowledgements of the study's technical panel and others who significantly assisted the study. The page is unnumbered.

- *Disclaimer*—The disclaimer identifies the fact that the report represents opinions of the researchers and not adopted policy, specifications, or standards. The wording must be used verbatim.

- *Technical Panel Acknowledgement*—The names and offices of technical panel members are listed to acknowledge their contribution to the study.

- *Other Acknowledgements*—Optionally, a brief acknowledgement of other important contributions may be listed after the Technical Panel Acknowledgement. Gratuitous acknowledgements should be avoided.

Standard Technical Title Page—The Standard Technical Title Page lists key study information in a tabular format used by the Federal Highway Administration and other agencies (Figure 11). It should be a single page numbered "*iii*". Certain entries are required:

- *Report No.*—Box 1 identifies the number of this report and, if applicable, the volume.

- *Title and Subtitle*—Box 4 lists the title and, if applicable, the subtitle of the report exactly as they appear on the front cover.

- *Report Date*—Box 5 lists the month and year of the report is published.

- *Authors*—Box 7 lists the author(s) names.

- *Performing Organization Report No.*—The performing organization may optionally use Box 8 to list its internal report number.

- *Performing Organization Name and Address*—Box 9 lists the name and mailing address of the organization that performed the research.

- *Work Unit No.*—The performing organization may optionally use Box 10 to list its internal project identification number.

- *Contract or Grant No.*—Box 11 identifies the SDDOT contract that funded the work.

TECHNICAL REPORT STANDARD TITLE PAGE

1. Report No. SD1993-14-F	2. Government Accession No.	3. Recipient's Catalog No.	
4. Title and Subtitle Enhancement of SDDOT's Pavement Management System		5. Report Date December 31,1994	
		6. Performing Organization Code	
7. Author(s) Richard Deighton, Newton Jackson, Gary Ruck		8. Performing Organization Report No.	
9. Performing Organization Name and Address Deighton Associates, Limited 112 King Street East Bowmanville, Ontario, Canada L1C 1N5		10. Work Unit No.	
		11. Contract or Grant No. 310265	
12. Sponsoring Agency Name and Address South Dakota Department of Transportation Office of Research 700 East Broadway Avenue Pierre, SD 57501-2586		13. Type of Report and Period Covered Final; October 1993 to December, 1994	
		14. Sponsoring Agency Code	

15. Supplementary Notes
An executive summary of this report is published as SD1993-14X. Four volumes of report appendices are also published as SD1993-14A1 through SD1993-14A4.

16. Abstract

The consultant provided basic services and software to enhance the South Dakota DOT's (SDDOT) pavement management system (PMS). During the first step, the consultant examined SDDOT's existing support structure for their PMS including their documentation, systems, policies, and data collection procedures. The consultant then made recommendations as to how those should be changed to support an enhanced pavement management process. Next, having concluded there was insufficient historical data to develop the necessary models using statistical procedures, the consultant designed a questionnaire to extract the expert opinion from experienced SDDOT engineers.

With the answers provided on those questionnaires, the consultant developed the following pavement management models and procedures: (a) a distress data collection survey to measure the extent and severity of various distresses important to SDDOT, (b) a set of deduct values necessary to convert the raw condition data to a set of condition indexes, (c) a family of performance curves for each condition index with one family member for each different pavement type, (d) a composite index used to define the overall health of an individual road section, and, when aggregated the overall health of the network, (e) a set of standard rehabilitation treatment types including their unit costs and their effects on the condition indexes, (f) a set of performance curves for the composite index that result after a treatment is applied, (g) a set of trigger limits telling the ranges of each condition index where a treatment is applicable, and a set of economic parameters used when generating a life cycle cost analysis of applying various strategies to all road sections.

The consultant then, configured and installed the following software on the department's micro computers: (a) a database management system loaded with current SDDOT data and capable of becoming SDDOT's historical PMS database, (b) an analysis system capable of evaluating a large number of alternative strategies for each road section and selecting the best strategy using optimization, and (c) an automated mapping system containing a digitized map of the SDDOT highway network which is linked to the historical PMS database and can display any data on the map in different colors or sizes on the map. Finally, the consultant trained SDDOT staff in the use and maintenance of the software.

17. Keyword	18. Distribution Statement No restrictions. This document is available to the public from the sponsoring agency.		
19. Security Classification (of this report) Unclassified	Security Classification (of this page) Unclassified	21. No. of Pages 268	22. Price

Figure 11 Sample Standard Title Page

- *Sponsoring Agency Name and Address*—Box 12 identifies SDDOT's Office of Research as the sponsoring office.

- *Type of Report and Period Covered*—Box 13 contains the report type (for example, "Final") and the dates, by month and year, the work was started and finished.

- *Supplementary Notes*—Box 15 identifies other reports and executive summaries published as part of the study.

- *Abstract*—Box 16 lists a briefly summarizes the study's objectives, tasks, findings and recommendations.

- *Distribution Statement*—Box 18 describes report availability and any restrictions that may exist. Access is usually unrestricted.

- *Security Classification (of this report)*—Box 19 identifies the report's security classification, which is normally "Unclassified".

- *Security Classification (of this page)*—Box 20 lists the security classification of the Technical Report Standard Title Page itself, normally "Unclassified".

- *No. of Pages*—Box 21 lists the total number of pages in the publication, excluding front matter.

Table of Contents—The table of contents lists the chapters, sections and subsections of the report with page references. The table of contents should begin on page *v*.

List of Figures—The list of figures shows figure numbers, captions, and page numbers. The list of figures should begin on a separate page following the table of contents. The page number is in lower-case Roman numerals.

List of Tables—The list of tables shows table numbers, captions and page numbers. The list of tables should begin on a separate page following the list of figures. The page number is in lower-case Roman numerals.

Report Body

The intellectual content of the report resides in logically organized sections of the report body. Each major section should be titled and should begin on an odd-numbered (right-hand) page to aid location.

The use of appropriate tables and figures is encouraged. They should be located within the body of the report, as near to their references as possible for the convenience of the reader. To conserve paper and to limit report thickness, the report body must be published double-sided. To aid legibility, margins of at least 25 mm (1 inch) should be used. Text should be in an uncomplicated serif font eleven points or larger. Line spacings should be between 1.2 and 1.5.

Executive Summary—The first chapter of the report should be a summary designed to inform managers within SDDOT and other interested agencies of the study's purpose, general approach, and significant findings, conclusions, and recommendations. The summary should concisely express the most important information about the project, without depending on references to other material in the final report. Usually, from three to ten pages is appropriate.

For consistency, conclusions and recommendations offered within the executive summary should match exactly those presented later in the final report. Because managers are likely to refer to the executive summary more often than to the full report, recommendations should be supported within the executive summary.

Problem Description—The second chapter should describe the problem that motivated the work. The researcher should supplement the description presented in the project's request for proposal with his or her own insights. Often, the discussion offered in the researchers's proposal or work plan, when updated to reflect insights gained during the investigation, comprises a good description of the problem.

Objectives—After the problem is stated, the study's objectives should be stated exactly as they were cited in the study's proposal or work plan. How, and to what extent, each objective was accomplished should also be described. The chapter should explain the relationship of the each research objective to the problem description.

Task Description—This chapter should state the project's defined tasks exactly as they were cited in the study's proposal or work plan. How, and to what extent, each task was accomplished should also be described. Usually, a task-by-task discussion is easiest to follow. The discussion must be sufficiently complete and clear to allow the study's technical panel to determine whether the project's tasks were accomplished fully, partially, or not at all, and to appreciate the technical significance of the work. Experimental plans should be clearly explained. Deviations from the defined tasks—either planned or to overcome problems—should be justified, explained and evaluated. The discussion should also explain the tasks' relationship to the study's objectives.

Findings and Conclusions—This chapter should explain what was learned from the study and assess the reliability of the findings. Results of surveys, tests, analyses, and other experimental techniques should be stated along with explanations of their significance.

Any limitations to the validity or applicability of the observations or analyses should be clearly stated.

Implementation Recommendations—The researcher should state, explain and justify any recommendations for implementation of the research. Recommendations may take any of several forms:

- specification changes
- policy changes
- procedural changes
- training recommendations
- further research
- other actions

To ensure that recommendations are correctly identified and properly stated, they should be numbered. The recommendation itself should consist of one to three concise sentences clearly stating what should be done, by whom and, if applicable, when. Recommendations should be sufficiently clear and complete to permit their understanding when quoted later outside of the context of the final report.

After each recommendation is stated, it should be more fully explained and suitably supported by reference to the findings and conclusions provided earlier in the report. Any limitations on the recommendation's applicability should be plainly stated.

Analysis of Research Benefits—The researcher should define a methodology for identifying and quantifying the benefits realized through the completed research. Based on reasonable assumptions established by consensus of the research team and the project's technical panel, benefits should be clearly identified and their potential financial value estimated.

References—Bibliographic references should be listed in a section following the remainder of the report body.

Appendices

Appendices should be reserved for material that is either lengthy or related to the research by reference. Appendices may contain voluminous tables or graphs, samples of survey or analysis forms, standards or other pertinent documents referenced in the report body. The researcher should refrain from including marginally related material in appendices, and should instead limit their use to pertinent information.

Internal Appendices—If appendices are short enough to include in the same volume as the final report, they should appear after the report body in alphabetical order (Appendix A, Appendix B, and so forth). They should be titled according to their content. Appendix titles—both letter and title—should be listed in the report's table of contents.

Glossaries and Acronym Lists—Inclusion of a glossary and list of acronyms as internal appendices is strongly encouraged. They should be included first, as Appendix A and Appendix B.

External Appendices—When appendices are too long to include in the final report, they should appear in supplemental, sequentially numbered (for example SD1994-13-F2) volumes of the final report. Each volume should include its own table of contents.

Copies

Beginning in the year 2000, researchers are no longer required to publish large numbers of final reports. Instead, the complete report, including all figures and tables, must be submitted in word processing format (WordPerfect® or Microsoft® Word), as well as Portable Document Format (Adobe® .pdf). It is the intent of the Office of Research to publish its research reports primarily by electronic posting to the Internet.

Executive Summary

Purpose and Length

Like the executive summary chapter of the final report, the stand-alone executive summary is designed to inform managers within SDDOT and other agencies of the study's purpose, general approach, and significant findings, conclusions, and recommendations. The summary must concisely communicate the most important information about the project, without depending on references to material in the final report. Usually, from three to ten pages is appropriate.

Conclusions and recommendations offered within a separate executive summary should match exactly those presented in the final report. Because managers are likely to refer to the executive summary more often than to the full report, recommendations should be supported within the executive summary.

Front Matter

With minor exceptions, the front matter of the executive summary follows the same form as the final report. The report number is the same as the final report's, except an "X" replaces the "F" (for example, SD1993-14-X). The report type likewise changes to "Executive Summary". Naturally, the table of contents and lists of figures and tables must match the content of the executive summary, not the final report. WordPerfect® and Microsoft® Word versions of front matter are available from the Office of Research.

Report Body

In virtually all cases, the body of the executive summary will consist of the final report's executive summary chapter. It is rarely appropriate to publish two different versions of the executive summary.

Appendices

Appendices should never be used in executive summaries.

Copies

Beginning in the year 2000, researchers are no longer required to publish large numbers of final reports. Instead, the complete report, including all figures and tables, must be submitted in word processing format (WordPerfect® or Microsoft® Word), as well as Portable Document Format (Adobe® .pdf). It is the intent of the Office of Research to publish its research reports primarily by electronic posting on the Internet.

Interim Reports

Purpose and Length

An interim report is similar to a final report, but is usually prepared at some significant juncture in the project, prior to its completion. It may advise the study's technical panel of preliminary findings and recommendations that will influence the direction of the remainder of the project, or report findings that can be adopted prior to project completion. Because an interim report requires substantial effort, it should not be used to report normal study progress. An interim (in constrast to a technical memorandum) is intended for publication.

The appropriate length for an interim report depends on its purpose. In some cases, an interim report may contain many important findings, and its length may compare to that of the final report. In other cases, especially when written early in a project, it may be much shorter.

Front Matter

The front matter of an interim report is prepared in the same manner as a final report, except that an "I" replaces the "F" in the report number (for example SD1993-14-I) and the report type is "Interim Report". The distribution statement in the Technical Report Standard Title Page should reflect SDDOT's intentions regarding publication.

Report Body

The body of the interim report should be organized in sections similar to those in a final report. The purpose of the interim report should be clearly stated. The report's content should focus on that purpose, but should include sufficient background to establish context within the entire project. The report should explain how the interim findings were developed, how they relate to the study's original objectives, and how they will affect the conduct of the remainder of the project.

Typically, the interim report is written upon completion of one or more of the project's defined tasks. The "Task Description" section of the report is a convenient place to describe how each completed task contributed to the interim findings and how future tasks may be affected.

Appendices

Appendices to interim reports should be treated in the same manner as appendices to final reports.

Copies

Beginning in the year 2000, researchers are no longer required to publish large numbers of final reports. Instead, the complete report, including all figures and tables, must be submitted in word processing format (WordPerfect® or Microsoft® Word), as well as Portable Document Format (Adobe® .pdf). It is the intent of the Office of Research to publish its research reports primarily by electronic posting on the Internet.

Technical Memoranda

Purpose and Length

Like an interim report, a technical memorandum is usually prepared at some significant juncture in the project, prior to its completion. Unlike an interim report, it will not be formally published. Because its audience is generally limited to the project's technical panel, it is typically formatted as a memorandum to the panel or project manager.

A technical memorandum may advise the study's technical panel of preliminary findings and recommendations that will influence the direction of the remainder of the project, or report findings that can be adopted prior to project completion.

The appropriate length for a technical memorandum depends on its purpose. In some cases, it may contain many important findings, and its length may compare to that of the final report. In other cases, especially when written early in a project, it may be much shorter.

Front Matter

Because a technical memorandum is not intended for publication, no specially formatted front matter is necessary.

Report Body

Because the purposes of technical memoranda are varied, no specific format is mandated, but it may be useful to organize a technical memorandum in sections similar to those in a final report. The purpose of the document should be clearly stated. Its content should focus on that purpose, but should include sufficient background to establish context within the entire project. The technical memorandum should explain how interim findings were developed, how they relate to the study's original objectives, and how they will affect the conduct of the remainder of the project.

Typically, the technical memorandum is written upon completion of one or more of the project's defined tasks. The "Task Description" section of the report is a convenient place to describe how each completed task contributed to the interim findings and how future tasks may be affected.

Appendices

Appendices to technical memoranda should be avoided.

Progress Reports

Purpose and Length

Researchers submit progress reports to advise the project manager and technical panel of activity, accomplishments, and problems during an active study. Studies longer than one year's duration usually require quarterly progress reports. Shorter reporting intervals may be required on shorter studies to ensure that progress is adequately reported.

The appropriate length of progress reports depends on the amount of activity that occurred during the reporting period, the nature of the topic, and the amount of interaction needed between the researcher and the project manager and technical panel. In general, progress reports should be simple and brief to encourage their being read; as few as one or two pages may be appropriate. When significant activity has occurred or is anticipated during the next reporting period, longer reports may be appropriate. Progress reports should rarely exceed ten pages in length.

Front Matter

Because progress reports are rarely bound, front matter is usually unnecessary. Instead, the first page of the report may simply have a header containing the study number and title, progress report number (sequentially from 1), submitter name and organization, and date.

Report Body

The body of the progress report should describe progress made during the reporting period, plans for the next reporting period, and overall project status. A quantitative estimate of the tasks' completion should also be reported.

Overview—A few paragraphs should explain the general status of the project. The extent to which objectives are being or are expected to be met should be stated along with a general assessment of the project's schedule and financial status. The information provided should allow a reviewer to determine whether the project is progressing satisfactorily or whether project revisions may become necessary.

Task Report—Each task should be identified and discussed within the context of what was completed before the reporting period, what was accomplished during the reporting period, and what yet remains to be done. Problems that were encountered should be explained, as should their solutions. To ensure that resources are available for future work, needs for upcoming SDDOT involvement should be stated. A percentage of completion, as of the end of the reporting period, should be listed.

Completion Graphs—Optionally, the status of task and project completion may be shown graphically. The Task Completion Graph (Figure 12) should identify each task and show the planned and actual progress as of the reporting date. The Project Completion Graph (Figure 13) should show the overall planned and actual progress history from the project beginning through the reporting date.

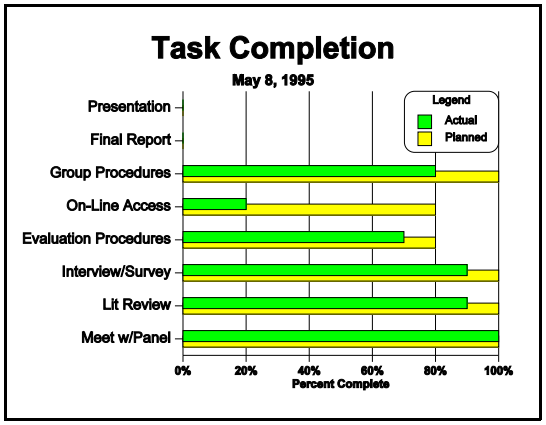

Figure 12 Task Completion Graph

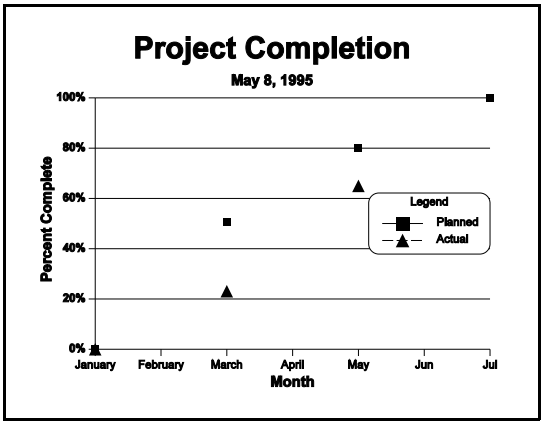

Figure 13 Project Completion Graph

INVOICES & ALLOWABLE COSTS

Research projects typically involve federal funding. The Office of Research relies on the Federal Acquisition Regulation (FAR), Title 48, Chapter 1, Part 31—*Contract Cost Principles and Procedures* for guidance in reviewing cost proposals, negotiating costs, and processing payments for services.

Invoice Submission

Invoices should be submitted in triplicate to the Office of Research. Invoices should be submitted regularly, preferably monthly, within forty-five days following the end of each billing period.

Documentation Requirements for Invoices

The actual documentation requested to process invoices is determined on a case-by-case basis considering:

- funding source, federal or state;
- the company's experience with federal requirements for allowable costs;
- the total amount of the contracts the company has with the Department;
- prior experience with the company's ability to invoice for reasonable, allocable and allowable costs; and
- whether the Department's Office of Internal Audits plans on administratively closing the contract when its completed with just a desk review or if a full audit will be performed.

Invoice Format

Invoices should list:

- the agreement number of the contract between SDDOT and the contractor;
- the company's job number and the accounting period covered by the claim;
- the personnel, using either names or employee numbers in addition to classifications;
- the base salary rate, claimed hours and an extension for claimed costs;
- a detailed listing of other direct costs, i.e., airfare, lodging, meals, mileage, long distance telephone, etc.;
- indirect costs;
- fixed fee.

Subcontractors' invoices must be included to support the prime contractor's invoice, and must contain the same level of detail and supporting information.

The Office of Research will check the accuracy of each claim and ensure that the claimed costs are reasonable and necessary for prosecution of the project to completion. The project manager will also ensure that contract payment provisions are complied with, including maximum limiting fees, fixed fee limitations, retainage, etc., and that the claims are within the period of performance.

Supporting Information

To ensure compliance with the Federal Acquisition Regulation, the Office of Research and the Office of Internal Audits require supporting information to accompany invoices, as summarized in Table 7.

Allowable Costs

The Federal Acquisition Regulation strictly governs the allowability of costs, both direct and indirect, on projects involving federal funding. A convenient (but not definitive) overview of the regulation is available from the American Association of State Highway and Transportation Officials (AASHTO) web site.[3]

[3]American Association of State Highway and Transportation Officials (AASHTO) (2001). *AASHTO Uniform Audit & Accounting Guide for Audits of Transportation Consultants' Indirect Cost Rates* [WWW document]. URL http://audit.transportation.org

Table 6 Supporting Information Required for Invoices

Cost Category	Supporting Information Required
Direct salary	Copies of time sheets will generally be required.
Indirect costs	A copy of an audit of the company's overhead/fringe benefit rates or a copy of the rate calculation work sheet will be needed prior to the first invoiced payment. Indirect cost rates are to be based on the company's most recently completed fiscal year. Depending on the reimbursement provisions and the duration of the agreement, the company may need to submit this information for multiple fiscal years. Similar information is required for each subcontractor and must be received prior to invoices including subcontracted costs.
Allocations for in-house costs	Copies of work sheets showing the costs (and accounts), usage, and rate calculations will be needed for such in-house allocations as vehicle mileage rates for company-owned vehicles, printing and copies, and computer costs.
Travel	A copy of the company's travel reimbursement policy is needed. Additional documentation to include with invoices would consist of copies of airline tickets and billings, lodging receipts, employee expense reports, and receipts for other reimbursed costs. If the company reimburses meals on an actual cost basis, copies of meal receipts will also be needed. If an employee's expenses include meals purchased for others, the expense report needs to list the individuals and the business purpose for incurring the cost.
Outside purchases other than subcontracts	Copies of vendor invoices supporting these charges may be requested. Sufficient information should be shown on the invoice to show that the expense was necessary for the project.
Subcontracts	A copy of every subcontract is needed. If a subcontract was not identified in the original proposal, a copy of SDDOT's approval for the subcontract is also needed. Subcontracts should include a statement that all provisions of the prime contract are included in the subcontract by reference. This will help ensure that, if federally funded, the subcontract will also be eligible for federal-aid reimbursement. Subcontracts must be fully executed prior to incurring subcontract costs. Costs incurred prior to establishing a subcontract cannot be reimbursed.

Common unallowed expenses include:

- advertising
- trade show expenses
- promotional materials
- memberships in civic organizations
- bad debts
- collection costs
- personal vehicle use
- contributions
- employee gifts
- social activities
- fines & penalties
- key-man insurance
- rework insurance
- interest expense
- lobbying costs
- organization & reorganization fees
- capital raising fees
- patent costs
- unsupported retainer agreements
- travel costs in excess of FTR rates
- goodwill
- alcoholic beverages

Specific questions concerning allowability of costs on any project should be directed to the Office of Research's project manager.

Retainage

The Office of Research routinely retains 10% of the total contract amount pending satisfactory completion of the work. Payments are made normally until 90% of the contract amount has been paid. The final 10% is withheld until the Office of Research's project manager authorizes full payment.

APPENDIX

SAMPLE AGREEMENT FOR A RESEARCH STUDY FINANCED WITH STATE PLANNING AND RESEARCH FUNDS COST REIMBURSEMENT CONTRACT

Agreement Number _____

This Agreement, entered into this __ day of _____, 20__, by and between the South Dakota Department of Transportation, hereinafter referred to as "State" and _____of _____, hereinafter referred to as "Contractor";

WITNESSETH:

WHEREAS, State has indicated the need for research described in this Agreement; and WHEREAS, Contractor has personnel able to conduct the research; and WHEREAS, State desires Contractor to conduct the study;

NOW, THEREFORE, it is agreed that Contractor shall conduct the study in accordance with the following:

Project Identity

For purposes of identification, this study will be identified by Research Project Number _____ and the Agreement number listed above. All invoices, reports and correspondence submitted to the State in connection with this Agreement shall be identified accordingly. All matters relating to this Agreement will be processed through State's Project Manager.

Scope of Work and Method of Study

Contractor, under direction of principal investigator _____, will undertake research described as _____
Contractor agrees to perform those tasks delineated in its proposal entitled _____ which is attached to this Agreement and incorporated herein by reference as Exhibit A.

Changes in Study

Changes in objectives and scope of the study which have significant bearing on the research must be approved prior to executing, in writing, by State and the Federal Highway Administration, hereinafter referred to as "FHWA". Requests for increases in study time or funding must be submitted to State before extra work is started and at least thirty (30) days prior to termination of this Agreement. All increases in study time or funding require execution of a supplemental Agreement.

Subcontracting

Contractor shall perform all work except specialized services. Specialized services are considered to be those items not ordinarily furnished by Contractor which must be obtained for proper execution of this Agreement. Neither this agreement nor any interest therein shall be assigned, sublet, or transferred unless written permission to do so is granted by State. Subcontracts anticipated at the time of proposal shall be itemized in Exhibit A to this Agreement. This does not, however, prohibit the subcontracting of work during the course of the execution of this agreement provided Contractor obtains prior approval of State.

Costs of subcontracted work incurred prior to execution of the corresponding subcontract shall not be eligible for reimbursement.

All subcontracts must contain all of the provisions of this Agreement.

Prompt Payment

Contractor shall pay subcontractors or suppliers within 15 days of receiving payment for work that is submitted for progress payment by the Department. If Contractor withholds payment beyond this time period, Contractor shall submit written justification to State upon request. If it is determined that a subcontractor or supplier has not received payment due without just cause, State may withhold future estimated payments or may direct Contractor to make such payment to the subcontractor or supplier. Prompt payment shall also include retainage moneies due to the subcontractor if Contractor elects to utilize retainage on subcontract work. The maximum amount permitted for retainage for any subcontract shall be 10%. Retainage shall be released within 15 days of satisfactory completion of the work.

Period of Performance

Contractor agrees that the study will be made during the period beginning _____ and ending _____, unless both parties to this Agreement agree in writing to a time extension.

Reports

Contractor will submit quarterly progress reports to State on every March 15, June 15, September 15, and December 15 included in the period of performance. Ten draft final reports and executive summaries shall be due to State ninety (45) days prior to the end of the period of performance. After reviewing the draft report, State will advise Contractor as to its acceptability and will request any changes that may be desired. An electronic copy, in word processing format (WordPerfect® or Microsoft® Word) as well as Portable Document Format (Adobe® .pdf), of the complete final report and the complete executive summary shall be due to State forty-five (15) days prior to the end of the period of performance.

Agreement Price

Contractor agrees to accept and State agrees to reimburse as full compensation for all services rendered and materials and supplies furnished under this Agreement, the actual costs incurred by Contractor in an amount up to, but not to exceed _____ dollars ($_____) as specified in the budget in Exhibit A.

Payment

Payments will be made to Contractor monthly, based on certified and itemized invoices detailed to show the elements of direct costs incurred, the various additives added to the payroll, and the overhead charges. Contractor shall submit invoices to the South Dakota Department of Transportation, Office of Research, 700 East Broadway Avenue, Pierre, SD 57501-2586 in triplicate within forty-five (45) days following the end of the billing period, for services rendered and for actual reimbursable expenses incurred during that period. The invoices and supplements thereto shall contain any details that may be required for proper audit. Contractor shall not submit billings for costs not permitted under South Dakota statutes or regulations. No payment shall be due Contractor until the account has been reviewed and approved by State.

State shall have the right to retain out of the total Agreement Price ten (10) percent of such amount pending final acceptance by State. Final payment to Contractor for work accomplished under this Agreement will be made upon acceptance by State. Allowable final costs will be determined in accordance with the provisions of OMB Circular A-102.

It is understood and agreed that funding for this study is dependent upon continuing appropriations of the South Dakota Legislature. In the event sufficient funding is not available, State may terminate this Agreement.

Records

Contractor shall maintain a cost accounting system capable of segregating and allocating costs incurred in connection with this Agreement. Furthermore, Contractor shall maintain accounting records, bills, invoices and other vouchers, or certified copies thereof if originals are lost, and make these records available to State at Contractor's office at reasonable periods during this Agreement period and for three years following the date of final payment. Such accounting records will be made available for State inspection and copies thereof shall be furnished, if requested by State.

All personnel employed by Contractor shall maintain time records for time spent performing work on study described in this Agreement for a period of three years from the conclusion of the study. Time records and payroll records for said personnel shall be similarly retained by Contractor for a period of three years from the date of final payment. The date of final payment is contingent on resolution of the final cost audit report.

Inspection of Work

State and FHWA shall at reasonable times be accorded proper Contractor facilities for review and inspection of the work in this Agreement. State shall have access to Contractor's premises and to all books, records, correspondence, instructions, receipts, vouchers and memoranda of every description pertaining to this Agreement.

Equipment

If items of equipment, including instrumentation or component parts, are required to conduct this study and are specified in Contractor's proposal, then no further approvals are required from State or FHWA. Any equipment purchased for this study but not budgeted in Contractor's proposal must have prior written approval by State and FHWA.

Any item of equipment with an acquisition cost in excess of One Thousand Dollars ($1000.00), which is not specifically identified but for which a cost item for equipment is contained in Contractor's proposal, must have specific approval by State and FHWA prior to purchase.

Title to all nonexpendable equipment (nonexpendable equipment is equipment that has residual value upon completion of the study) shall rest with State. Ninety (90) days prior to the end of the period of performance, Contractor shall supply to State an itemized list, including descriptions, purchase costs, and estimated salvage value, of equipment purchased during the course of the study.

If at the conclusion of the study Contractor desires to acquire title to nonexpendable equipment from State, Contractor may ask State for title. If State elects to grant title, State shall be allowed a credit from Contractor's final payment equal to the current salvage value as determined by mutual Agreement between Contractor and State, subject to applicable surplus property laws.

Contractor certifies that no item of equipment purchased for the study has been included in any indirect costs that are approved by State for this study.

Rental of Space, Equipment or Facilities

The actual cost to Contractor of renting any additional space, special equipment or facilities not owned by Contractor but required for the study and listed in Contractor's proposal, are hereby approved by State, subject to a limitation of the period of performance of this Agreement.

State approves the items and classes of items, such as office equipment, typewriters, computers, files, tables, laboratory or other items shown in Contractor's proposal as the indirect costs of the study. Those costs are included in the Agreement price.

Travel

Contractor agrees that no out-of-state travel costs will be charged against this study without prior consultation with, and written approval of State. For purposes of this agreement, out-of-state travel is defined as travel to or from states other than Contractor’s location and the State of South Dakota. If no in-state travel is specifically called for in Contractor's proposal, but becomes necessary, said travel must have prior approval of State.

Publication

Papers, reports, forms or other material which are a part of the work under this Agreement will not be copyrighted without written approval of State. State and FHWA reserve a royalty-free, nonexclusive, and irrevocable license to reproduce, publish, and otherwise use, and to authorize others to use, the work for government purposes.

Either party to this Agreement may initiate a request for publication of the final or interim reports, or any portions thereof. Neither party to this Agreement shall publish or otherwise disclose, or permit to be disclosed or published, the results of the study herein contemplated, or any particulars thereof, during the period of this Agreement, without notifying the other party and securing its consent in writing. Academic theses may be published without written consent, providing the disclaimers contained in this Agreement are provided.

When the scheduled time for presentation of a paper by one party to this Agreement does not permit the formal review and approval of a complete report by the other party, abstracts may be used for notification of intent to present a paper based on the study. Such presentations must

protect the interests of the other party by inclusion of a Statement in the paper and in the presentation to the effect that the paper has not been reviewed by the other party.

Both written and oral releases are considered to be within the context of publication. However, there is no intention to limit discussion of the study with small technical groups or lectures to employees or students. Lectures to other groups which describe the plans, but disclose neither data nor results, are permissible.

All reports published by Contractor shall contain the following Statement in the credit sheet:

> "The contents of this report reflect the views of the authors who are responsible for the facts and accuracy of the data presented herein. The contents do not necessarily reflect the official views or policies of the South Dakota Department of Transportation, the State Transportation Commission, or the Federal Highway Administration. This report does not constitute a standard, specification, or regulation."

In the event of failure of agreement between State and Contractor relative to the publication of the final report, or any progress reports during the period of this Agreement, State reserves the right to publish independently, in which event the non-concurrence of contractor shall be set forth, if requested by Contractor.

If State, with the concurrence of FHWA, does not elect to publish the final report, publication by Contractor shall then be a matter of province of Contractor's policy.

Publication by either party shall give credit to the other party except: a) upon failure of agreement by both parties on any report of the study or b) if either of the parties requests that its credit acknowledgment be omitted.

Ownership of Data

The ownership of data collected under this Agreement, together with summaries and charts derived therefrom, shall be vested in State.

Proprietary and Patent Rights

State and Contractor agree that if patentable discoveries or inventions should result from the study conducted under this Agreement, the provisions of Exhibit C, which is incorporated herein by reference, shall apply.

Americans With Disabilities Act

Contractor agrees to provide services in compliance with the Americans with Disabilities Act of 1990.

Civil Rights

Contractor shall abide by the requirements of Title 6 of the Civil Rights Act of 1964. These requirements are attached as Exhibit B and are hereby made a part of this Agreement.

Code of Conduct

Contractor warrants that it has not employed or retained any company or person, other than a bona fide employee working solely for Contractor, to solicit or secure this contract, and that he has not paid or agreed to pay any company or person, other than a bona fide employee working solely for Contractor, any fee, commission, percentage, brokerage fee, gifts or any other consideration, contingent upon or resulting from the award or making of this contract. For breach of violation of this warranty, State shall have the right to annul this contract without liability, or, in its discretion, deduct from the contract price or consideration, or otherwise recover, the full amount of such fee, commission, percentage brokerage fee, gift, or contingent fee and prosecute under applicable criminal law.

Certification Regarding Debarment, Suspension, Ineligibility and Voluntary Exclusion

Contractor certifies, by signing this agreement, that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation in this transaction by any Federal department or agency.

Independent Contractor Provision

While performing services hereunder, Contractor is an independent Contractor and not an officer, agent, or employee of the State of South Dakota.

Any employee of the Contractor engaged in the performance of services required under the agreement shall not be considered an employee of the State. Any and all claims that may or might arise under the worker's compensation Act of the State of South Dakota on behalf of said employees or other persons while so engaged and any and all claims made by any third party as a consequence of any act or omission of the part of the work or service provided or to be rendered herein by the Contractor, shall in no way be the obligation or responsibility of the State.

Insurance

Before the Contractor begins providing service, the Contractor will be required to furnish the State the following certificates of insurance and assure that the insurance is in effect for the life of the contract:

A. Commercial General Liability Insurance: Contractor shall maintain occurrence based commercial general liability insurance or equivalent form with a limit of not less than $1,000,000 for each occurrence. If such insurance contains a general aggregate limit it shall apply separately to this Agreement or be no less than two times the occurrence limit.

B. Professional Liability Insurance or Miscellaneous Professional Liability Insurance: Contractor agrees to procure and maintain professional liability insurance or miscellaneous professional liability Insurance with a limit not less than $1,000.000.

The insurance provided for general liability and errors and omissions shall be adequate for the liability presented, and shall be written by an admitted carrier in the State of South Dakota.

C. Business Automobile Liability Insurance: Contractor shall maintain business automobile liability insurance or equivalent form with a limit of not less than $500,000 for each accident. Such insurance shall include coverage for owned, hired and non-owned vehicles.

D. Worker's Compensation Insurance: Contractor shall procure and maintain workers' compensation and employers' liability insurance as required by South Dakota law.

Before beginning work under this Agreement, the Contractor shall furnish the State with properly executed Certificates of Insurance which shall clearly evidence all insurance required in this Agreement and which provide that such insurance may not be canceled, except on 30 days' prior written notice to the State. The Contractor shall furnish copies of insurance policies if requested by the State.

Protection of Contracting Authority

Contractor agrees to hold harmless and indemnify the State of South Dakota, its officers, agents, and employees, from and against any and all actions, suits, damages, liability or other proceedings which may arise as a result of the negligence, misconduct, error or omission of Contractor or any officer, agent or employee of Contractor performing services hereunder. This section does not require Contractor to be responsible for or defend against claims or damages arising solely from acts or omissions of the State, its officers, agents or employees.
Independent Contractor Provision

While performing services hereunder, Contractor is an independent Contractor and not an officer, agent, or employee of the State of South Dakota.

Any employee of the Contractor engaged in the performance of services required under the agreement shall not be considered an employee of the State. Any and all claims that may or might arise under the worker's compensation Act of the State of South Dakota on behalf of said employees or other persons while so engaged and any and all claims made by any third party as a consequence of any act or omission of the part of the work or service provided or to be rendered herein by the Contractor, shall in no way be the obligation or responsibility of the State.

Termination of Agreement

Either party to this agreement may cancel this Agreement upon giving thirty (30) days written notice of such cancellation to the other party. If this Agreement is terminated under this paragraph, Contractor shall deliver to State all work product produced up to the time of termination. State shall reimburse Contractor for all work completed to the date of termination.

Controlling Law

This Agreement shall be governed by and construed in accordance with the laws of the State of South Dakota. Any lawsuit pertaining to or affecting this Agreement shall be venued in Circuit Court, Sixth Judicial Circuit, Hughes County, South Dakota.

Disputes

Any dispute concerning a question of fact in connection with the work not disposed of by agreement between the parties hereto shall be referred to State's Secretary of Transportation or his duly authorized representative for determination, whose decision in the matter shall be final and conclusive on the parties to this Agreement.

Other Conditions

None.

Signatures

IN WITNESS WHEREOF, the parties have executed this Agreement by their duly authorized officers on the day, month, and year written above.

Contractor State

By:_____ By:_____
Research Program Manager

Title:_____ Approved as to Form:_____
Assistant Attorney General

EXHIBIT B

CONTRACTOR ASSURANCE
WITH REGARD TO THE CIVIL RIGHTS ACT OF 1964
AND U.S. DEPARTMENT OF COMMERCE REGULATIONS, 15 C.F.R., PART 8

During the performance of the Agreement, Contractor and any subcontractors, for themselves, their assignees and successors in interest (hereinafter referred to as the "contractor"), agree as follows:

Compliance with Regulations: The Contractor will comply with the Regulations of the Department of Commerce relative to nondiscrimination in federally-assisted programs of the Department of Commerce (Title 15, Code of Federal Regulations, Part 8, hereinafter referred to as the Regulations), which are herein incorporated by reference and made a part of this contract.

Nondiscrimination: The contractor, with regard to the work performed by it after award and prior to completion of the contract work will not discriminate on the ground of race, color, or national origin in the selection and retention of subcontractor, including procurement of materials and leases of equipment. The contractor will not participate either directly or indirectly in the discrimination prohibited by Section 8.4 of the Regulations, including employment practices when the contract covers a program set forth in the Appendix A-II of the Regulations.

Solicitations for Subcontractor, Including Procurement of Materials and Equipment: In all solicitations either by competitive bidding or negotiation made by the contractor for work to be performed under a subcontract, including procurement of materials or equipment, each potential subcontractor or supplier shall be notified by the contractor of the contractor's obligations under this contract and the Regulations relative to nondiscrimination on the ground of race, color, or national origin.

Information and Reports: The contractor will provide all information and reports required by the Regulations or orders and instructions issued pursuant thereto, and will permit access to its books, records, determined by the State Department of Transportation or Federal Highway Administration to be pertinent to ascertain compliance with such Regulations, orders, and instructions. Where any information required of a contractor is in the exclusive possession of another who fails or refuses to furnish this information, the contractor shall so certify to the State Department of Transportation, or the Federal Highway Administration as appropriate, and shall set forth what efforts it has made to obtain the information.

Sanctions for Noncompliance: In the event of the contractor's noncompliance with the nondiscrimination provisions of this contract, the State Department of Transportation shall impose such contract sanctions as it or the Federal Highway Administration may determine to be appropriate, including, but not limited to, withholding of payments to the contractor under the contract until the contractor complies, and/or cancellation, termination or suspension of the contract, in whole or in part.

Incorporation of Provisions: The contractor will include the provisions of paragraph (1) through (6) in every subcontract, including procurement of materials and leases of equipment, unless exempt by the Regulations, order or instructions issued pursuant thereto. The contractor will take such action with respect to any subcontract or procurement as the State Department of Transportation or the Federal Highway Administration may direct as a means of enforcing such provisions including sanctions for noncompliance; provided, however, that, in the event a contractor becomes involved in, or is threatened with, litigation with a subcontractor or supplier as a result of such direction, the contractor may request the State to enter into such litigation to protect the interests of the State, and, in addition, the contractor may request the United States to enter into such litigation to protect the interests of the United States.

EXHIBIT C

PROPRIETARY AND PATENT RIGHTS

(1) The CONTRACTOR agrees to disclose each subject invention to the STATE within a reasonable time after it becomes known to CONTRACTOR personnel responsible for the administration of patent matters, and that the STATE may receive title to any subject invention not disclosed to it within such time.

(2) The CONTRACTOR agrees to make a written election within two years after disclosure to the STATE (or such additional time as may be approved by the STATE) whether the CONTRACTOR will retain title to a subject invention: provided, that in any case where publication, on sale, or public use, has initiated the one year statutory period in which valid patent protection can still be obtained in the United States, the period for election may be shortened by the STATE to a date that is not more than sixty days prior to the end of the statutory period: and provided further, that the STATE may receive title to any subject invention in which the CONTRACTOR does not elect to retain rights or fails to elect rights within such times.

(3) When the CONTRACTOR elects rights in a subject invention, it agrees to file a patent application prior to any statutory bar date that may occur under 35 USCS Section 1 et seq. due to publication, on sale, or public use, and shall thereafter file corresponding patent applications in other countries in which it wishes to retain title within reasonable times, and that the STATE may receive title to any subject inventions in the United State or other countries in which the CONTRACTOR has not filed patent applications on the subject invention within such times.

(4) With respect to any invention in which the CONTRACTOR elects rights, the STATE and United States government shall have a nonexclusive, nontransferable, irrevocable, paid-up license to practice or have practiced for or on behalf of the STATE or the United States Government any subject invention throughout the world: provided, that the funding agreement may provide for such additional rights; including the right to assign or have assigned foreign patent rights in the subject invention, as are determined by the STATE or United States Government as necessary for meeting the obligations of the United States under any treaty, international agreement, arrangement of cooperation, memorandum of understanding, or similar arrangement, including military agreement relating to weapons development and production.

(5) The STATE retains the right to require periodic reporting on the utilization or efforts at obtaining utilization that are being made by the CONTRACTOR or his licensees or assignees: provided, that any such information as well as any information on utilization or efforts at obtaining utilization obtained as part of a proceeding under 35 USCS Section 203 shall be treated by the STATE as commercial and financial information obtained from a person and privileged and confidential and not subject to disclosure under 5 USCS Section 552.

(6) The CONTRACTOR agrees that in the event a United States patent application is filed by or on its behalf or by any assignee of the CONTRACTOR there shall be included within such application and any patent issuing thereon, a statement specifying that the invention was made with STATE support and that the STATE has certain rights in the invention.

(7) In the case the CONTRACTOR is a nonprofit organization, (A) the CONTRACTOR agrees to prohibit the assignment of rights to a subject invention in the United States without the approval of the STATE, except where such assignment is made to an organization which has as one of its primary functions the management of inventions (provided that such assignee shall be subject to the same provisions as the contractor): (B) The CONTRACTOR shall share royalties with the inventor; (C) except with respect to a funding agreement for the operation of a Government-owned-contractor-operated facility, that the balance of any royalties or income earned by the CONTRACTOR with respect to subject inventions, after payment of expenses (including payments to inventors) incidental to the administration of subject inventions, shall be utilized for the support of scientific research or education; (D) that, except where it proves infeasible after a reasonable inquiry, in the licensing of subject inventions shall be given to small business firms; and (E) with respect to funding agreement for the operation of a Government-owned-contractor-operated facility, (i) that after payment of patenting costs, licensing costs, payments to inventors, and other expenses incidental to the administration of subject inventions, 100 percent of the balance of any royalties or income earned and retained by the CONTRACTOR during any fiscal year up to an amount equal to 5 percent of the annual budget of the facility, shall be used by the CONTRACTOR for scientific research, development, and education consistent with the research and development mission and objectives of the facility, including activities that increase the licensing potential of other inventions of the facility; provided that if said balance exceeds 5 percent of the annual budget of the facility, that 75 percent of such excess shall be paid to the STATE and the remaining 25 percent shall be used for the same purposes as described above in this clause (D); and (ii)) that, to the extent it provides the most effective technology transfer, the licensing of subject inventions shall be administered by CONTRACTOR employees on location at the facility.

(8) The requirements of 35 USCS Sections 203 and 204 apply to this research.

(9) If the CONTRACTOR does not elect to retain title to a subject invention in cases subject to this section, the STATE may consider and after consultation with the CONTRACTOR grant requests for retention of rights by the inventor subject to the provisions of 35 USCS Section 202 and regulations promulgated hereunder.